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Australian Personal Computer

ARCHIVES P.C.
BENCHTESTED

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AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE



HOME COMPUTER SURVEY
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BBC Microcomputer

The teaching computer

for those who have

done their homework



The BBC Microcomputer is the mainstay of the British educational system and will take their youth confidently into the 21st century.

The success of the BBC Computer Literacy Project is spreading rapidly across the world.


In Australia, a very large number of BBC school computer systems have already been installed in every state.

Why? Because 'The BBC' is not just an educational computer. It is one part of the British Government's project to produce the best microcomputer for education, plus the whole range of software and training aids needed to secure for youth the advantages of computer literacy in the coming computer age. Software abounds. The TV 'Computer Programme' has only begun. There is a wide variety of books and teacher aids. And the list grows constantly.

Australia is fortunate to be able to adopt the entire project without change — and to enjoy all the future developments. For the BBC Computer Literacy Project is ongoing. It will still be with us in the 21st century.

Of course, you are probably aware that Barson Computers were selected to distribute the BBC micro in Australia and New Zealand because they have the desired technical expertise, and are capable of giving BBC Microcomputer users a very high level of support indeed.

You see, the BBC did their homework, too.

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When the BBC was assigned the task of producing a computer system for education, serious criteria were also established for the development of software which would form the basis of education today, and on into the 21st century. As a result, more quality educational software has been developed for the BBC Micro than for any other educational computer. Not for the BBC the 'structured reinforcement' (drill and practise) variety of software. Here are examples of subjects, for students of all ages, covered by the world's most exciting educational and recreational software library.

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Computer Learning

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Games and Educational Games

Fun With Words. Doctor Who. Fun Games. Philosopher's Quest. Monsters. Sphinx. Superlife. Adventure. Games of Strategy. Pirates. Snapper. Planetoid. Katakombs. Rocket Raid. Meteors. Super Invaders. Arcadians. Arcade Action. Games of Logic. Sliding Block Puzzle. Missing Signs. Cube Master. Chess. Time. Sailing Ships/navigation. Campaign 1346. Disraeli 1875. Castle of Riddles. Starship command. Missile Base. Snooker. Draughts. Reversi.

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Symbols to Moles. Lenses. Approximation, Estimation and Standard Form. Longitudinal Waves. Climate. Compass and Bearings. Yacht Race.

French

Repondez. Comprenez.

Logical Thinking

Venman. Vennkid. Shape. Gate. Watchperson. Spanish Main. Cat and Mouse. Logic Games. Concentration.

Language Arts

Early Learning. Word Hunt. Word Sequence. Sentence Sequence. Unscramble Spell. Pattern Recognition. Quiz. Anagram. Box/Wordshape. Dictionary Game. Vocabulary Practice. Hang the Man. Spelling Test Creation. List of Spelling Tests. Vocabulary Tester.

Mathematics

Fractions. Tables. Number Balance. Number Sequence. Maths Topics 1. Ultracalc. Algebraic. Manipulation. Trains/Arithmetic. Snap/Fractions. Ergo/Arithmetic. Morless/Number Concept. Abacus. Moving Modules. Multiplication. Speed Drills: Addition, Subtraction, Multiplication and Division. Read Speed Drills. Clear Speed Drills. Dice Addition and Subtraction. Long Multiplication. Area and Perimeter. Factor and Base Games. Equations, Pythagoras and Directed Number Games. Pythagoras Rule. Processes. Skill Counter.

Music

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Evolution and Natural Selection. Particle Scattering. Genetic Mapping. Enzymic Kinetics. Homogenous Equilibrium. Gas Chromatology. Organic Synthesis. Decomposition. Sulphuric Acid. Synthesis of Ammonia. Element. Formulae. Gas Laws. Rates of Reaction. Reaction Kinetics. Compound Identification. Diet Analysis. Organic Analysis. Plant Competition, Photoelectric Effect. Mass Spectrometer. Planetary Motion. Gravitational Fields. Capacitor Discharge. Gaseous Diffusion. Radioactive Decay. Electric Impedence. Acoustics. Collisions. Momentum. Alpha/Range/Fraun/Decay. Chemical Analysis. Chemical Structures. Chemical Simulations. Atomic Structure/Equilibrium. Projectiles. Satellite Orbits. Orbits and Alpha Scattering. Exponential Growth and Decay. Alphafoil. Nuclei. Gravity. Quantum Shuffler. Random Walk. Ampere. Millikan. Malthus. Watts in Your Home. Moving Molecules. Photosynthesis. Metabolic Pathways. Wave Motion. Transverse Waves. Interference and Diffraction of Waves.

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Note: The above describes existing cassette or disk software by title or content, and is a partial list only. Additional teaching aids including books, audio and video cassettes, tutors and OHP's, are all part of the BBC Computer Literacy Project. Software by Australian and International publishers and developers: Acornsoft, Advisory Unit, Cambridge Educational Software, Edward Arnold, Golem Software, Heineman, Input, Longman, Micro Primer, Passionfruit Software, Tas & WA Education Departments.

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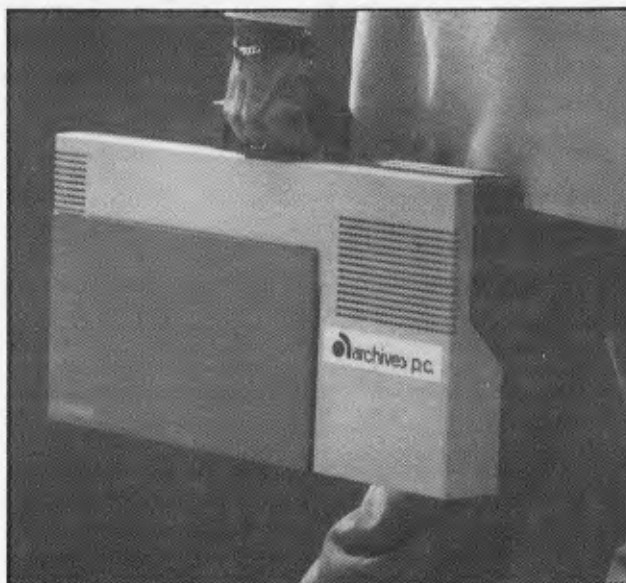
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Taste the difference

As of today, should you be idiotic enough to want to use a computer on a picnic in the country, you need an enormous battery, or a very long power lead, or a 'lap-held' computer. And at the moment there are three lap-held computers from which to choose.

The Epson HX-20 has been joined by the Tandy 100 (tested by *APC* last month). These two have been recently joined by the NEC version of the Tandy.

The most important thing about the Tandy and the NEC 8201 is that they are as near identical as possible, and that most of their advantages and disadvantages — when compared with the Epson — are the same.

As you can tell from the pictures the NEC is different from the Tandy in shape, in the number of special function keys, and in the layout of the keyboard.

Use it, and you realise quickly that although it may appear to be the same beast in a different box, the software has been changed too.

The software was designed for NEC and Tandy by Microsoft Japan and the hardware was presented in nearly final form by the builder Kyocera (also Japanese).

The differences between the Epson and the two other machines are simple to list: the Epson has a much smaller display, showing only 80 characters, whereas the Kyocera beasts have 320; the Epson is a lot slower in its processing; the Kyocera machines use very much less power (so can use ordinary AA cells) and have automatic power turn-off ability to save those batteries; the

Epson has an integral tape and printer, and the Epson has a better keyboard.

So much for lists, the meaning of it all is that the Kyocera machine effectively makes the Epson obsolete, were it not for the accumulation of software for the Epson over the past year.

And the Kyocera twins have enough essential text editing, communications and programming language abilities to make up a lot of that ground.

Where they differ from each other is in the amount of memory available. Both have a 32 kbyte block of memory occupied by program chips, and theoretical maximum of 32 kbytes left for the owner. The chip involved is the equivalent of an Intel 8085.

So, while the NEC has the same 64 kbyte theoretical maximum memory as the Tandy, NEC has chosen the option of having two memory boards, each with its ration of 32 kbytes, and each of which it can alternately 'plug into the system' by software means. The result is that it can take 64 kbytes of free memory for storing text and data.

Normally this wouldn't be much of an advantage, because the programs running in the 32 kbyte of ROM can only access one 'page' of 32 kbytes at a time. But on the current Kyocera design there are no portable disks, so the memory is all you have.

Those who remember the *APC* review (September issue) will recall that Tandy's machine includes a text editor, a Basic Interpreter, a telecom program, and two string-finders: one called a schedule organiser, and the other called an address book.

Now these two programs are very simple. But though they may not do much, they do work up to their own

limited standards, and the temptation is to use them to store often-used names and the diary arrangements for the month ahead.

Take a standard eight kbyte machine, put a couple of dozen names in, a couple of dozen dates, and it instantly becomes clear that you can't edit more than about 500 words of text — and you certainly can't keep a Basic program of much more than about twenty lines.

Now my own experience, having played with a Tandy for a couple of months, shows that 24 kbytes is usable, but only just. I use the thing for interviews, typing in the victim's answers to questions, and getting the advantage of having the quotes go straight into my final story, verbatim.

But there isn't room for two interviews and two articles. And when memory gets crowded, the only place Tandy will offer you to store some of the stuff permanently is an ordinary cassette recorder, something so unreliable as to be worth counting right out except in emergencies.

Having an extra 32 kbytes of memory will, of course,

cost extra, because the special memory (CMOS) chips used to get this ultra-miserly power consumption are costly.

But this time next year, the cost of these chips will be very much less, and the pressure to have more memory will be very much more as useful programs come onto the market.

Always remember the first law of computer memory: 'You need more than you have.'

There are other differences between the two Kyocera machines but ignore the extra plug on the NEC machine. It's a phone connection.

The original design for both versions includes a telephone interface — something to dial remote computers and to send data down the line.

In Australia, thanks to the energetic, go-ahead nature of Telecom authorities, a battery-powered computer with four AA cells has to be isolated from the phone network in case the computer gives engineers a dangerous electrical shock. And the long and involved process of checking to see that the safety circuits work



The NEC8220 has two memory boards totalling 64kbytes.

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The Archives P.C. has a clear 80 column display format. A television interface is provided. The 40 column mode displays bold characters for easy vision on most TV sets. The optional 80 column monitor provides high quality display for office or home use.

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The "P.C." is distributed by one of Australia's leading microcomputer distributors. A growing network of representatives are providing nationwide support for the Archives P.C. systems. Utilising latest robotic testing technology on the Archives P.C.'s production line, maximum system reliability is achieved.

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Archives Computers (NZ) Ltd., 419 Remuera Rd, Remuera, Auckland 5, New Zealand. Phone (9) 503 548.



The Tandy's striking feature is the 40 character by 8 line display.

is unlikely to be complete before Christmas.

You can't argue this one with the authorities.

The NEC machine has a socket marked FD for a floppy disk. Tandy expects to have one of these 'soon' too, but my guess is that existing users won't be able to plug it in quite as soon or as easily as NEC users.

I couldn't get hold of an official manual or a machine before press time so, although it is clear (for example) that the telecom program on the NEC is more complex than that on the Tandy, I couldn't try it out.

The fact that the NEC has fewer special function keys is not as significant as it looks. Each key performs some function (in Basic, for example, one key will LIST a program, and in telecom mode, one key will transmit a file, and so on) but the NEC doubles up the functions by displaying alternative functions when you press the shift key. I think the Tandy design is

better, but it hardly makes or breaks the machine.

But there are software differences, even in the Basic. For example, the NEC uses the standard Microsoft Basic construction of 'LOCATE' to move the cursor to a given point on the screen. Tandy, on the other hand, has insisted on its normal 'PRINT\$' statement. On the NEC it is possible to use the nice cursor key cluster to edit any 'immediate mode' commands you give — like 'KILL "TANDY DO"' whereas on the Tandy, a mis-type means you have to retype the whole command again.

Most of these differences point to NEC having accepted the Microsoft design, and Tandy having insisted on last-minute modifications. So it's equally possible that the NEC doesn't have equivalent faults.

I don't have the full list of Tandy bugs. I can tell you, for instance, that the text editor can't cope with left hand brackets, that the

machine cannot print line feeds, and that if you try to add text in the middle of a document, the computer gets so snarled up trying to keep the document straight that it can't keep track of what you're typing.

The line feed problem is particularly irritating. My Epson is (like many) set to move the paper up by a line *only* when the computer tells it. All Tandy printers however, do this automatically whenever you have finished a line.

I wasted two good days trying to write a little Basic routine to put line feeds into my text files, to stop them all printing on one line of paper. A great paper-saver, yes, but not much help on legibility. Have you ever seen 3000 words on one line?

In the end I found that there is a routine, built deep into the Tandy code, which actually *strips all line feeds out* before transmitting them.

It would not be right to end a list of criticisms of the design without adding that every computer user should look to get one of these.

If Tandy ever asks for the test model back, there could be quite a fight.

Guy Kewney

Public distribution company

Shortly after its successful float, Video Classics Ltd has announced the formation of a new division, Computer Classics, headed by Gerry Gerlach. In a statement made recently, the division claimed to approach the computer industry "head on". Computer Classics intends to establish itself as a major force in the computer industry, dis-

tributing hardware and software throughout Australasia, the Pacific and South East Asia.

In an enlightening statement Gerry Gerlach says, "The computer industry has grown dramatically in the past two years, to such an extent that microcomputers are more technically advanced than ever before. Computer Classics intends to lead the field in microcomputers through the distribution of the Commodore 64 and VIC 20, as well as handling an extensive range of computer software and home electronic entertainment products."

"We are distributing our products through specialist computer dealers, electrical retailers and other organisations who show a keen understanding and commitment to the personal computer and consumer electronics market. The personal computer industry is growing and diversifying and we will grow with it."

Personal CP/M on chip

CP/M is set to penetrate the home computer market, with the launch of a ROM version for machines which cost as little as \$300, according to Digital Research. Personal CP/M, a variation of the 8-bit standard operating system, is one of two initial products from the company's newly-formed Consumer Products Division. The other is the Visual Information Processor set of I/O routines to give window facilities and mouse cursor control to even the smallest micros.

Digital Research formed the Consumer Products Division to tackle the home and education markets with a range of in-house

developed and third-party applications software. General Manager Ken Harkness predicts that eight million home computers will be sold in 1984 and says that DRI intends to be "the leading supplier" of software to that market.

The company sees the new class of dual-purpose computers emerging: the personal-business, costing between \$500-\$1500, and one of the aims of launching Personal CP/M was to bring the 6,000 odd packages written for CP/M into this area.

Designed for machines based on Intel or Zilog 8-bit processors, or Intel 16-bit, Personal CP/M is fully menu-driven with help screens and prompt lines in English language. VIP adds a further dimension by providing a visual interface and animation for operating system utilities.

The resulting system is reminiscent of a less-sophisticated Apple Lisa without icons, but with the same attention to detail. Files on a disk may be presented as a filing cabinet and, on selection by an arrow key moved by the space bar or mouse, the drawers open on the screen to expose the files within. Demonstrated as part of the Monarch environment developed for Commodore, a menu window appears on the right-hand side of the screen, with a prompt box at the bottom, and a larger working window on the left.

VIP consists of 60 routines written in "C" for portability, which allow the programmer to set up adjustable window areas, and provide the means for programs to share data or for the user to switch from program to program. DRI has dubbed VIP the "software bus", because it can underly many different types of application, such as word processing, spreadsheets,

communications, and operating system utilities themselves. It is also readily adaptable to different environments using an object module link library, which appends machine-specific code to a generic application.

Although DRI is wary of disclosing details of applications software packages to be sold by the Consumer Products Division, it has said that many are likely to be based on Dr. Logo, its graphics-oriented educational programming language. An advanced form of Logo, Dr. Logo is already available for the IBM, PC and PC-XT and fits in with DRI's strategy to sell consumer products under PC-DOS and MS-DOS, as well as the CP/M family.

"By this time next year we will have Personal CP/M, Dr. Logo and a full range of Dr. Logo educational packages ready for the schools," said Harkness.



This is Personal CP/M.



Ken Harkness heads consumer division

Hitachi has laserdisc

Hitachi in Japan has announced that it has an optical storage system ready, and is taking orders as of now for delivery in autumn next year.

This is also the date set by Shugart's Optimum division for the launch of a similar product.

The optical data disk uses a semiconductor laser to read and write data, and uses very similar technology to the Philips Laservision videodisk machine already on the consumer market.

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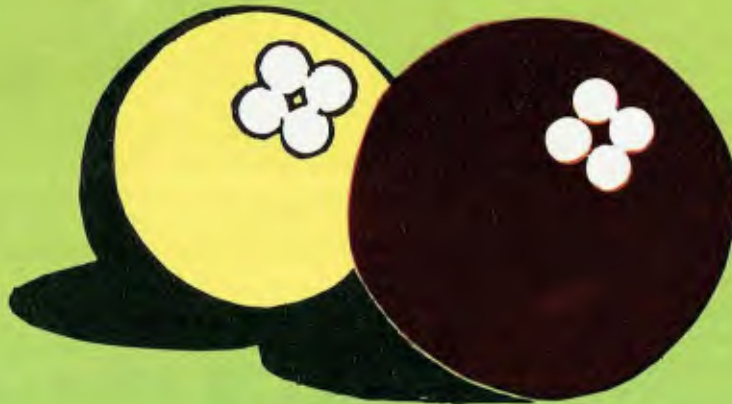
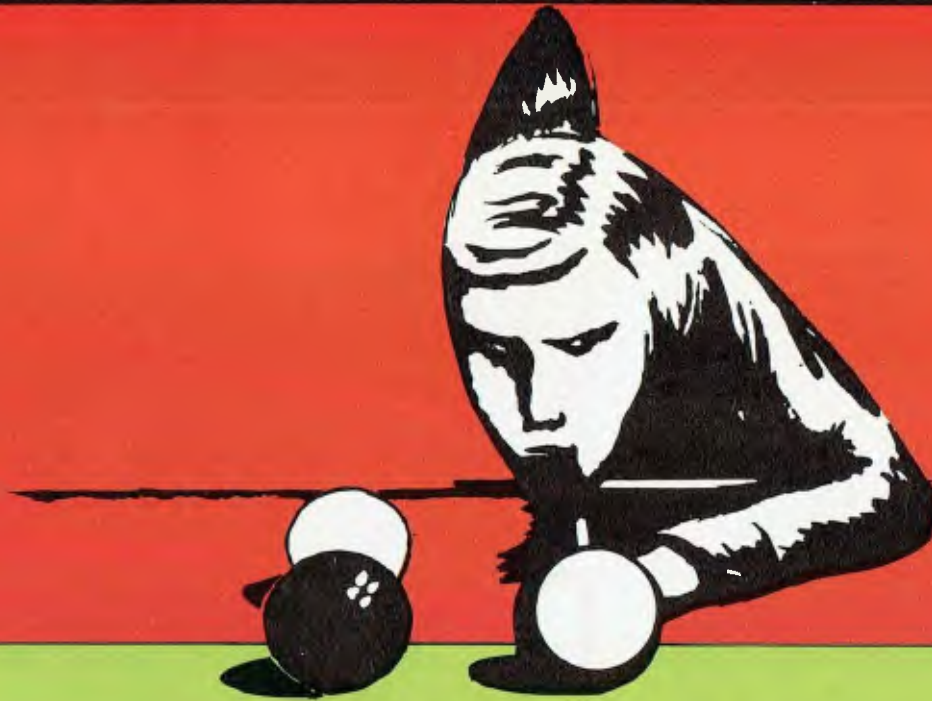
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| 3. One Player — BALL IN ITS POCKET | 6. Two Players — LOWEST AND HIGHEST |

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Hitachi's systems will use a disk jointly developed by Hitachi and its media subsidiary Hitachi Maxell.

The basic system, the H-6975-1, stores up to 1,310 megabytes — equivalent to 20,000 A4 pages — of data on one side of a 12in disk. It can store illustrations as well as computer data, and can get at the information with an average access time of 250ms.

But Hitachi also has a complete library device on offer, which includes either 16 or 32 optical disks. The Hitfile 60 can store up to 86,460 megabytes of data, over a million A4 pages, and can be connected to eight terminals for retrieval. Like Lisa, the system uses screen icons and a mouse, and involves a disk controller, a high-resolution display, a printer, a facsimile adapter,

and the optical disk units.

The price is not yet disclosed, but a Hitachi insider predicted that it would certainly be competitive with anything Shugart produced.

Shugart's Optimem machine which "will appear this year", is a 1 gigabyte (1,000 megabyte) machine using the same 12in disk technology as Hitachi. Price will be in the \$6,000 to \$7,000 range in OEM quantities, so the Hitachi drive — not the library — should be somewhere in the same region.

Shugart claims that the cost per byte is much lower than the highest-density winchester drive.

NCC News

The biggest computer show in the world is Hanover; the

Americans, however, all believe that the biggest is the one they call the National Computer Conference, or NCC.

It dates from the days when computers were rare beasts, and the people who worked with them needed a convincing excuse, once a year, to get together and swap ideas. Somebody had the idea of bringing a few publicity materials for their own company, and it turned into an exhibition.

This year it happened in Los Angeles, right on top of Disneyland. Cynics might say that Disneyland was the only reason I went — and looking back, I find myself wondering, seriously, what else I got out of it.

First of all, it is not permitted to actually *sell* anything there. Sell? Tut, tut, how gentlemanly: this is a

conference, not a vulgar market. No, show the product, by all means, but no sales. Not even any contracts please.

Second, the people who go there are the people who don't actually rate a travel budget except to go to the NCC. It is the NCC, therefore their boss can't say 'What kid's carnival is it you want to go to this time, Brian?' and fork out the air and motel fare. They are called 'system specifiers' in the trade.

To talk to these clerks, the companies provide appropriate level personnel. On each stand there is a failed car/insurance/holiday/central heating salesman. He will smile, shake your hand, smile, invite you to the hospitality tent, smile, press brochures on you, and smile. Ask a serious question,

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however, and you will get a blank stare if you're lucky.

There were important people there, to be sure. I could have phoned them up and had equally fruitful discussions with most.

Next year, I shall go to Comdex Spring.

Sharp chose the NCC to show bubble memory, still the dream of those who want to replace spinning magnetic disks with spinning magnetic 'domains' on a solid state chip.

The machine which had the bubble looked incredibly like the lap-held Gavilan, but had bubble instead of disk. I would automatically prefer the disk were it not for the fact that the Sharp, at \$2000 would be half the price of the Gavilan at \$4000. Apparently the full spec will include IBM-like MS-DOS operating software.

A man called Paul Terrell wandered onto several stands looking vague, and asking for news of portable 16-bit micros. 'I want something like the Compaq, which is IBM-compatible, but smaller and movable,' he said, 'but I want it now. Compaq can't provide enough.'

He wanted it for a revolutionary new idea to sell cartridges for computers and video games by loading the software into a blank cartridge — and offering the retailer a computer to do this loading job.

What is really interesting is that of the dozens of people offering IBM-compatible micros, and portable ones at that, the only one found at the NCC who could actually sell more

than one or two was Compaq. And Compaq was already selling all the machines it could make.

Guy Kewney

Atari shows its hand

Futuretronics has released the Atari 600XL and 800XL onto the Australian market with retail prices of \$399 and \$599 respectively. These are just two of a range of thirty five products announced which includes a color printer, an eighty column "letter quality" printer with a capacity of twenty characters per second, bi-directional capability and a suggested price of \$499, and a CP/M module featuring a Z80 processor, 64k of RAM and either 40 or 80 column video display. The price hasn't been announced for the CP/M module.

Other items are a color

plotter, a touch tablet controller, remote control joysticks (enabling users to control game play from anywhere in the room), track-ball controller and a 16k Logo cartridge.

Harry Chojna and Peter Alpar, joint MDs of Futuretronics Australia said "Our objective is to capture the major share of the Australian home computer market. We now have the products to do this and we know that Atari will be a force to be reckoned with. They are the best in the world today and no-one competing against us can make such a product offering. It is a commitment by Atari and Futuretronics Australia Pty Ltd. to deliver to the marketplace the products that are needed."

In the US, Atari has announced a 64k RAM, 24k ROM 1450xLD up-market machine. The unit includes an integrated 5 1/4" disk drive with a storage capacity of 254k and speech synthesiser.

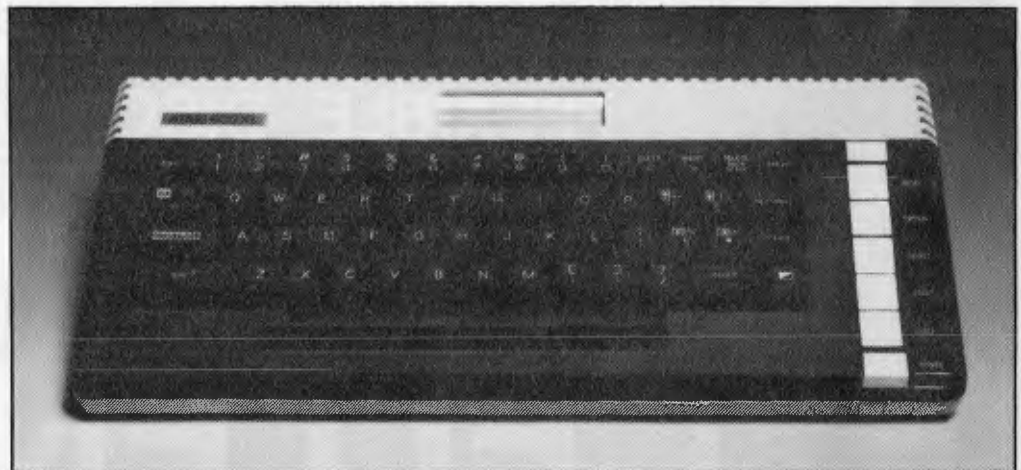
Unfortunately the display is still on forty columns wide. It should be available in Australia next year.

So there it is. The major items in Atari's line up which is hoped to make Atari a "force to be reckoned with" over the next couple of years. Contact Futuretronics on (03) 579 2011 for more details.

Microsoft buys up

Microsoft has announced its purchase of the Sydney company Wisser-Microsoft, which has been the exclusive Australian distributor of its products.

According to Microsoft's International Vice President, Scott Oki, "Microsoft Corporation's commitment to the Australian marketplace is expanding and both Wisser and ourselves feel that it is desirable to change the



Atari's new low-end machine, the 16k 600XL, sells for \$399.



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form of Wiser-Microsoft in order to better realise this larger commitment. This is why we've made the distributorship our wholly owned subsidiary."

Mr Oki continued "All of the staff at Wiser-Microsoft will be staying on. Wiser's General Manager, Linda Graham, will now be the General Manager of the new company which will continue to trade at the Terrey Hills facility. We will be adding a number of additional staff to broaden out the levels of service we plan to provide."

Enquiries should be sent to 21 Tepko Road, Terrey Hills, NSW 2084 or telephone (02) 450 2522.

VISI upgrade

Visicorp enhanced its Visiseries family of software products with the announcement of hard disk support for the IBM PC and XT personal computers. The upgraded products include The VisiCalc, Vistrend/Plot, Visifile, Visiword and Visispell programs now, and the Visischedule program to be available later in the year.

Visicorp said existing Visiseries data files stored on floppy disks can be loaded onto a hard disk and used with the new programs.

Imagineering is the exclusive Australian distributor for Visicorp products. Telephone: (02) 358 3011.

OS allegiances waver

IBM compatibility continues to be an industry battle-cry. While Digital Research's CP/M-86 and Microsoft's MS-DOS fight for supremacy (with the emphasis now

turning to the question of concurrency), many manufacturers of 16-bit business systems are taking the middleground and ensuring their machine runs both operating systems.

The Vector Graphic range has, until recently stuck with DRI's CP/M and CP/M-86 but now Dicker Data (the Australian distributor of Vector Graphic machines) has announced that MS-DOS is available for Vector 4 machines. Fiona Dicker, Marketing Manager of Dicker Data said "Vector's version of CP/M-86 supports co-existing operating systems, therefore allowing users to run software under both operating systems on the same hard disk."

To indicate which way Vector is facing (in the middleground) while the OS war rages, MS-DOS will not be included in the price of a Vector system. It will be an option.

Dicker Data is on (02) 525 2122.

Jetset to the CES

For \$2395 Jetset tours will take you from Sydney or Brisbane to the 1984 Las Vegas Winter Consumer Electronics Show and bring you back 15 days later. During that time you'll tour Auckland for a half day, spend roughly a day in Honolulu and four days in Las Vegas, and have time for a trip to Disneyland.

The price includes return economy air fare, "first class" hotel accommodation on a twin share basis, round trip transfers between airports and hotels, a tour escort, registration fee at the CES Show and scenic tours. The price does not include meals and drinks, excess baggage



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VIC 20

NIGHT RIDER Now a challenging motor car driving game is available on cassette. You control your path down the twisting road increasing speed by joystick control. High speed action in this exciting game. How fast can you complete 3 kilometres? **\$15.95.**

KONGO KONG This game provides hours of jumping barrels and climbing ladders. The object of the game is to climb the ladders to the top in order to reach the maiden in distress. **\$19.95.**

ANNIHILATOR In this defender-type game, your aim is to defend your moon base from the attacking aliens who will launch heat seeking missiles to destroy you. If any game on the Vic without memory expansion requirements wins the prize for speed, this is it! **\$19.95.**

TREK Commanding the bridge of your starship, you explore the galaxy, fending off the Klingon invasion with your phasers and photon torpedoes. **\$16.95.**

MOSQUITOES: Vic 20 Trapped beneath massive stone walls, you must find the key, evade attacking mosquitoes and escape through the locked door. Armed with insect spray, you must avoid destruction by escaping through the mysterious ventilation tunnels. Four very exciting levels packed with action. **\$19.95.**

TYPING TUTOR: Vic 20 Improve your typing skills using this simple typing tutor. Includes practice of letters, words, sentences and a keyboard trainer. Colour and sound make learning fun. For standard Vic 20. **\$19.95.**

HEAD-ON Players have been known to start playing Head-On at 8:30 pm and at 2:00 am wonder where time went. Move your car as fast as you can dare around the tracks. You get three cars and must avoid the computer car. **\$17.95.**

GRAVE ROBBERS A thrilling adventure game like never before, Grave Robbers will have you crawling under your seat as the thunder roars and the rain pours. Try to work out the clues to opening the grave of "LEO OIL" in order to get to the tunnel and vault below. Fascinating graphics lend a lot to this game. If you think you are good at adventure games, try this one!! **\$19.95.**

COMMODORE 64

GRAVE ROBBERS Introducing the first graphics adventure ever available on the Commodore 64! With realistic audio visual effects you explore an old deserted graveyard and frightfully see the perils that lie beyond. **\$19.95.**

ANNIHILATOR Now this fast-paced defender style game is available for the Commodore 64. Your aim is to defend you moon base from the attacking aliens who launch heat seeking missiles to destroy you. Using the 64's sprite graphics and excellent sound, Victory Software has managed to come up with this exciting game that will keep you going for hours. **\$24.95.**

TREK Commanding the bridge of your starship, you explore the galaxy, fending off the Klingon invasion with your phasers and photon torpedoes. **\$16.95.**

ADVENTURE PACK I (3 programs) Big Bad Wolf — adventure based on the Three Little Pigs fairytale. Don't let the wolf gobble you up. Computer Adventure — re-live the "excitement" of getting your computer. Moon Base Alpha — you must find a way to destroy the meteor that is racing towards your base. **\$19.95.**

ADVENTURE PACK II — (3 programs) African Escape — as the sole survivor of a plane crash you must find your way out of the dark continent.

Hospital Adventure — you are a spy whose mission is to complete the bungled assassination attempt on the evil dictator.

Bomb Threat — get back to town to warn authorities of the bomb planted by terrorists. **\$19.95.**

MICRO-BEE

FROGGER is modelled after the popular game of the same name. Your Frog is in a real predicament. He must firstly hop over a four lane highway, dodging cars and trucks. If he survives, he must then negotiate the flooded river, jumping from log to log until he arrives safely home. FROGGER is a real favourite with children because it is easy to learn but takes ages to master. **\$17.50.**

ASTEROIDS PLUS is the finest high resolution graphic arcade game available for the MicroBee computer. It features spinning 3-D point by point resolution graphics, shields, intelligent beings, guided missiles, black holes, high-score board and beathaking sound effects. ASTEROIDS PLUS took more than 1,000 man hours to write and cost in excess of \$20,000 to develop. You owe it to yourself to experience the best in arcade games on your MicroBee. "ASTEROIDS must be the best hi-res graphic arcade game on the market for the Bee." *Your Computer*, June, 1983. **\$22.50.**

KILOPEDE & GHOST MUNCHER come on the one cassette together! KILOPEDE is the very popular ATARI "CENTEPEDE" game and GHOST MUNCHER is our version of PAC MAC. These two hi-res arcade style games are great value. **\$17.50.**

METEOR RESCUE is a high speed graphics arcade game. The mission is to shuttle earthlings from the planet surface to the mother ship without colliding with meteors and other spinning 3-D objects. The game increases in difficulty as the score rises. **\$17.50.**

DEFENDER needs no introduction. The DEFENDER arcade game is one of the most popular ever produced and we expect that our MicroBee version will be the same. **\$22.50.**

VZ-200

DEFENCE PENETRATOR

Can you destroy strategically placed missile bases or will they SCRAMBLE our system?

Now you are the Pilot of the VZ-200 Annihilator, the deadliest surface attack spacecraft known. Your mission is to infiltrate enemy territory on remote planetoids carrying the deadly QUACKER 5000 air to surface super bombs and your own crafts high output intercept to destroy torpedoes. Destroy until destroyed!

Enemy defences will try to eliminate you with carefully stationed auto-launch ballistic missiles and Skyhawk Destroyers. Rugged surface terrain and feak meteor storms will hinder you as you rain down fiery devastation upon their surface and underground nuclear reactors and supply depots. With NERVES OF STEEL you must try to recover your steadily diminishing fuel supply in flight and reach the climax of your mission!

Can you cross the 2000 KM of swooping scenarios?

Can you reach the enemy COMMAND BASE and smash it to atoms?

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charges or "services of a personal nature". If Jetset would like a good honest appraisal and review of its tour, send a ticket to APC.

Games machine add-on

Videoactiv Electronics has announced the Compumate — an add-on keyboard for the Atari 2600 games machine.

The unit sells for around \$120 and includes 16k of ROM (including a Basic language), 2k of RAM and a 42 key touch-sensitive keyboard. It can be plugged into a cassette recorder for the usual storing and loading of programs and data (six programs are available for \$19.95 each) and also features two octaves of two channel sound capability.

Further details are available from Videoactiv Electronics on (03) 537 2000.



Coleco's computer system is a package with 80k of memory, a digital storage pack system that is claimed to be as fast as a floppy disk, a daisywheel printer and keyboard. All this is expected to sell for \$1200 when it's launched next year.

The storage unit is a multi-track cassette tape unit which can hold up to a 1/2 Mb and the graphics are equal to those of the CBS ColecoVision games machine. See 'Chip Chat' on page 172 for more information.

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MICROBEE

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DEFENDER needs no introduction. The DEFENDER arcade game is one of the most popular ever produced and we expect that our MicroBee version will be the same.

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KILOPEDE & GHOST MUNCHER come on the one cassette together! KILOPEDE is the very popular ATARI 'CENTIPEDE' game and GHOST MUNCHER is our version of PAC MAN. These two hi-res arcade style games are great value.

\$17.50

FROGGER is modelled after the popular game of the same name. Your Frog is in a real predicament. He must firstly hop over a four lane highway, dodging cars and trucks. If he survives, he must then negotiate the flooded river, jumping from log to log until he arrives safely home. FROGGER is a real favourite with the children because it is easy to learn but takes ages to master.

\$17.50

BACKGAMMON plays the game of the same name on your MicroBee! The game conforms exactly to that set down in the Official Rules of the International Backgammon Association, including rules of doubling and scoring. Playing BACKGAMMON on a board is a thing of the past!

\$17.50

METEOR RESCUE is a high speed graphics arcade game. The mission is to shuttle earthlings from the planet surface to the mother ship without colliding with meteors and other spinning 3-D objects. The game increases in difficulty as the score rises.

\$22.50

MYTEK WORDPROCESSOR is truly an amazing product! Now, for the first time, MicroBee owners can use a powerful and time saving Wordprocessor that is entirely cassette and RAM based. The MYTEK Wordprocessor is technology's most up-to-date Electric Typewriter. Although powerful beyond belief, the MYTEK Wordprocessor is quick and simple to

use. Both handwritten letters and typewriters are now a thing of the past. Any member of your family, club or office will be able to save time and improve the look of their essays, letters, assignments, documents, shopping lists, recipes, accounts, mailing lists and all other correspondence. Everybody can benefit from the MYTEK Wordprocessor.

Cassette \$35

EPROM \$39

TRSBEE is a package of three programs that loads TRS-80 Model 1 and 3 program tapes into the MicroBee without any additional hardware. Although some program editing will still be required prior to their running, the majority of program typing time is saved by TRSBEE. The first program loads TRS-80 BASIC programs into MicroWorld BASIC. Most programs may then be edited and run. The second program in the package loads any TRS-80 machine code file into MicroBee memory. The third program loads TRS-80 assembler files into the MicroBee EDITOR/ASSEMBLER. Any TRS-80 Model 1 or 3 may be loaded. TRSBEE opens up a whole new world of possible software on your MicroBee!

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MusicB is a composer/editor program for the serious music maker. MusicB takes over where COMPOSER BEE finishes. MusicB has enormous flexibility, range, tone adjustment and is essentially a mini music language. Even complex sound effects can be produced! MusicB makes chopsticks of the BASIC PLAY command.

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EDITORIAL

MYTEK Computing is now one year old. During this time the company has developed and marketed a range of quality hardware and software products. MYTEK Computing has earned the reputation of being the largest and most respected independent producer of software for the MicroBee computer. MYTEK Computing reaches more than 1000 MicroBee users with its free catalogue mailing list and also markets through a network of dealers and software houses. If you wish to receive this catalogue, just ring or write to us. Our mail order

department guarantees despatch of all orders within 24 hours. By means of top quality products and an aggressive marketing approach, we aim to reach at least 90% of MicroBee users.

In order to meet users expanding requirements, MYTEK Computing is continually developing new products and enhancing existing products. If you have a suggestion for a new product or a comment about an existing product, please contact us by phone or in writing. Suggestions are always welcome.

Because of the large amount of time required to write high quality software, we are looking outside of ourselves for programmers. We are willing to pay our programmers well because we only market the very best in software, which results in high volume sales.

If you have a program, completed or not, know of someone who has, or would like to do some programming, then please contact us. All software is treated with the strictest confidence. We are more than willing to talk and correspond with you. Let us help you turn a hobby into an income! You may wish to enter your program into our competition. See details on the back page.

MYTEK Computing prides itself with its customer backup and service. If you have a problem or suggestion, please contact us directly. You will find us even more helpful than your local MicroBee dealer. All our software has a money back guarantee. If you are dissatisfied with our product in any way for whatever reason, return it to us and we will refund your money in full.

MYTEK Computing is a small and personal enterprise, and intends to stay that way. You may ring us during office hours, Monday to Friday, and speak to one of our competent staff (don't forget the time difference between states). I, myself, am sometimes hard to catch so we have set aside Wednesday afternoons as a time that you will be able to speak to me personally.

Sincerely,
 MYTEK Computing

Richard Swannell
 Manager

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Fill out the following form and send it to MYTEK Computing

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Postage — Allow \$1 per item	
TOTAL	

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All MYTEK programs come on cassette and will run on any 16K or 32K MicroBee Plus or IC. We are able to take phone orders if a bankcard is being used.



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The Australian micro scene as viewed by Frank Linton-Simpkins.

Oh Brave New World that hast such people In't

The other Sunday as I was sipping my coffee and Soma and wondering how badly genetic engineering could be relied on to be, I raised mine eyes to the high places where stands my television set.

There before my astounded eyes sat, as I live and breathe, Barry Jones, Philip Adams, Professor Birch the Biologist, the lucky countryman Donaid Horne and an authority on Australian letters, Professor Leonie Kramer. It was, something of the mixture as before, and something of the future as hope.

They were inquiring into the proposition that George Orwell was wrong in the novel "1984" with his "Thought Police" and Ministries of Love and his Proles and his Big Brother. The US commentator Walter Cronkite had made a documentary on "1984" in which he argued that it was here and had arrived early.

None of the above considered that Orwell had got it right and all expressed a touching faith in both man and his future, but then none of them was involved with the computer industry.

It was odd that none of the people above mentioned the old Medibank database which will now become the new Health Insurance file. This database fulfils all the requirements of a "Big Brother" type file as it contains data on every person in Australia and his or her address.

In the last 20 years there have been only two publicised surveys of public

attitudes to computers and their introduction. These were both on the North American continent and both showed that no one was particularly concerned by possible invasions of privacy. The survey showed that the people most at risk of computerised privacy intrusions already have their privacy invaded in so many ways that they just expect a future with more of the same. They aren't too concerned, just impotently angry.

What the majority of people fear from computers is that they will lose their jobs to the machines. There would seem to be more than some basis in this fear since in recent times ICL, IBM and Barry Jones have all said that the introduction of computers will almost certainly cost jobs.

In the event after watching Jones and friends, (biologists and retired quiz show winners always seem to think so clearly). I adjusted the red sash of the "Junior Anti-Sex League" to make myself more comfortable and had another bash at the Soma.

Confine them all to room "101", I say. Do it to Julia. 1984 will never come.

Who Nodes what secrets lurk in the heart of CSIRO?

CSIRO and Office Automation have jointly produced the ultimate device, the cabin baggage sized networking node.

More than this, Barry

Jones, (Oh come now, you all know Barry the ubiquitous?) has announced that CSIRO will buy and install 41 of the \$9000 devices on CSIRONET. What will happen about the other 2000 or so nodes on the network? Will DEC opt for the Sword of Apology? What do you do with 2000 one owner pre-loved DECPDP-11s?

For IBM's is the Kingdom and the Power and the Glory

On my left (IBM will be surprised that anything is), was a Detroit Electric Brougham, overhead was a Bleriot XI, to my right (naturally) an exhalation of IBM archpriests and there in front was Barry Jones.

This odd collection was at the Sydney Powerhouse Museum for the official

opening of Information Technology Week by the minister for the post-industrial society who was speaking from the rear of a reproduction late-19th-century rail platform.

After the speech by Barry, "Shakespeare, Goethe and Mozart wrote with a quill pen. Now we have the IBM golfball typewriter and Ita Buttrose and John Laws", and the Great Western in great quantities, the guests could cruise around an exhibition of the history of information technology in Australia.

The innocent attendee at this exhibition would have gained the idea that IBM could utter: "Before Von Neuman was, I am". Snow White was pervasive in the extreme and history was writ largely in grey and blue.

At the exhibition nothing, save only a rather exhausted Powers Samas Automatic key punch, was allowed to interfere with the image of IBM as the sole historical supplier of computers to Australia.

IBM had provided the



Jack Major of Office Automation Pty Ltd (on left) and John Payne, from the CSIRO Division of Computing Research, with a CSIRONET micronode. The terminal is an example of the equipment that can be connected to the micronode.



I don't care what IBM says, I want to get into Local Area Networking.

cash for the ITW exhibition and perhaps it is churlish to regret that the result doesn't really reflect reality as far as history went.

Behind the speaking platform used by Barry Jones there was a set of IBM gear, an IBM 1401, either an IBM 1620 or an 1130 (which it was I was unable to get close enough to see) an IBM valve punch card calculator and part of an IBM 370/155.

This all means that some of the history of computing in Australia might have become a bit obscured. Briefly, the first computer in Australia and the fourth in the world was CSIRAC built by Dr Trevor Pearcey in Sydney for CSIRO. The first commercial computer in the land was the Elliot 405 installed by NCR in its York Street office in 1958, the first solid state computer was the

Univac SS80 installed by Remington Rand Chartres, the first computer in Oz to use a high order language was a Honeywell 800 installed in the Defence Department's Russell Hill offices and so it goes.

The first Federal Government Computer was a Burroughs E101 installed at Treasury, the first bank computer was a GE225 at the ANZ in Melbourne and the first time sharing computer was the GE 225, plus Datanet in GE's service bureau in Sydney.

IBM did have the first insurance computer at either AMP or MLC in 1959. What this means is that IBM has come from behind in almost all the areas in which it now leads the marketing of computers. What can one expect from the project curiously codenamed

"Peanut"?

One recalls the problems with the fictional home computer Proteus IV and ponders what I/O units IBM will market with Peanut.

A hole card that failed

There is something about the modern computer or computer related equipment that manages to annoy gentlemen from the US south.

In Kentucky one man has shot an IBM terminal and now further south in Florida another local has taken violent action against a terminal of unknown make.

This man, a person who was not able-bodied, actually

had a proper cash card but the machine not only refused to disgorge his money, it lunched his card and then shut itself down.

Enraged (understandably, under the circumstances), the man heaped abuse on the thing. This failed. He then struck it repeatedly with his standby crutch — this assault also failed and the machine remained in a sort of dynamic halt and retained his card.

Then asking the surrounding people to move away on the grounds that they might not like to witness the scenes of violence that were to follow, he reached into the concealed holster on his wheelchair and emptied his hand gun into the terminal, effectively switching it off for ever. Police in Florida are in the process of deciding what

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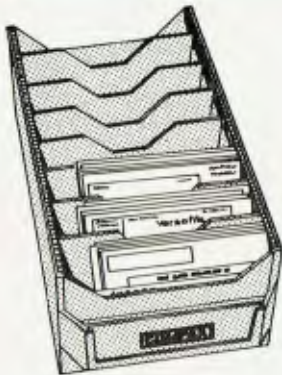
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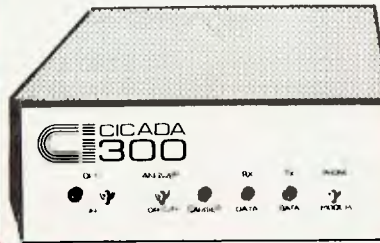
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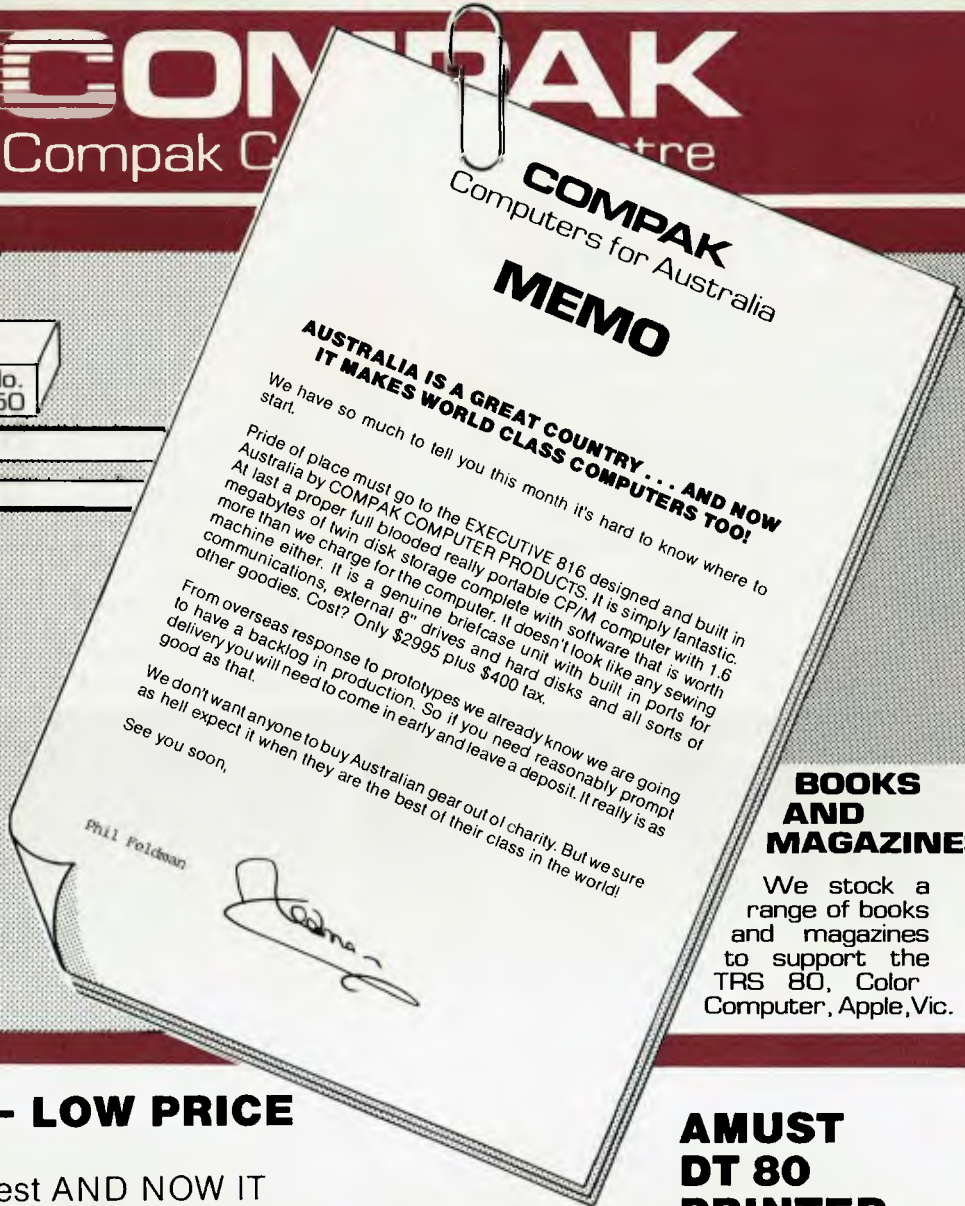
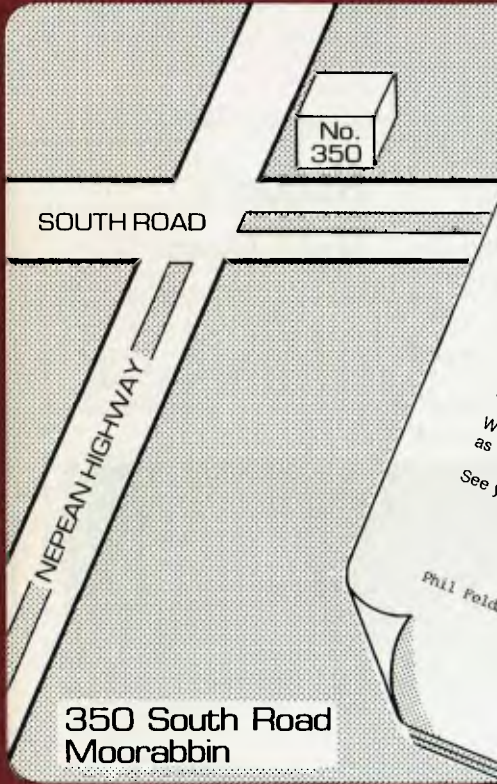
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MEMO
AUSTRALIA IS A GREAT COUNTRY... AND NOW IT MAKES WORLD CLASS COMPUTERS TOO!

We have so much to tell you this month it's hard to know where to start.

Pride of place must go to the EXECUTIVE 816 designed and built in Australia by COMPAK COMPUTER PRODUCTS. It is simply fantastic. At last a proper full blooded really portable CP/M computer with 1.6 megabytes of twin disk storage complete with software that is worth more than we charge for the computer. It doesn't look like any sewing machine either. It is a genuine briefcase unit with built in ports for communications, external 8" drives and hard disks and all sorts of other goodies. Cost? Only \$2995 plus \$400 tax.

From overseas response to prototypes we already know we are going to have a backlog in production. So if you need reasonably prompt delivery you will need to come in early and leave a deposit. It really is as good as that.

We don't want anyone to buy Australian gear out of charity. But we sure as hell expect it when they are the best of their class in the world!

See you soon,

Phil Feldman

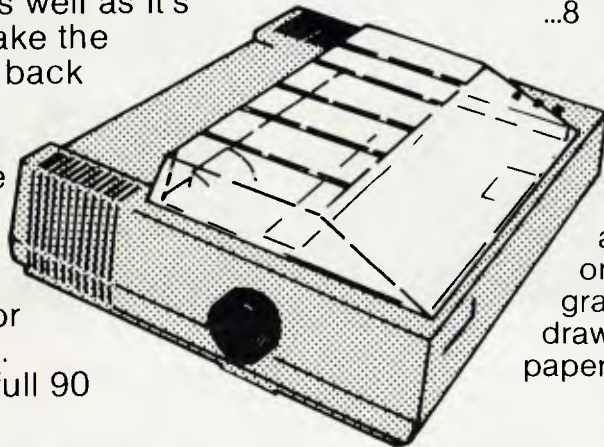
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charge to hit him with.

Frankly, his is not such a bad idea and the people most put upon by these wretched machines, people like me whom they instinctively hate, should all whip out sawn-off equalisers and pull the triggers like this, Blam-Blam.

Musique Concrete

Whistling a tune from the Mother country, it's called

the "Mason's Apron" and probably has violent words, this simple Jesuit trained journalist entered the Masonic building on the rough end of Sydney City. With the necessary garlic about my person and other amulets against harm etc, I was entering this place that looks like a set design for the main scene in Aida in order to hear a paper that was to deal with the choice: computers or lawyers?

It was all organised by the NSW Society for Computers and the law and safe conduct had been granted to

ancient foes to allow free passage to the Corinthian room.

In the upshot, the choice between computers and a legal profession that had to eat, drink and sleep, was decided in a rather nice and traditional legal manner. There being no precedent to aid the people in their decisions, the matter was in fact referred to a higher court. Frankly I can't see the computer takeover of the legal profession as any more likely than a takeover of mainland China by anyone. There might be an invasion

perhaps even a conquest, but in the long run the lawyers, like the Chinese, will be able to absorb the invaders and make them one with the locals.

Hacker's Half Hour

One of the problems in being a Hacker is that you aren't always sure where a good database is and this makes life hard for the young.



Honeywell's new business system, the microsystem 6/10, is based on large-scale integration technology. The central processor, the Micro 6, is a firmware controlled 16-bit microcomputer that is compatible with the instruction set of the company's 16-and 32-bit DPS 6 minicomputers. This allows the new system to run the same operating system and a range of application and communications software now running on the larger systems. The microsystem 6/10 also offers a 16-bit Intel 8086 processor option that supports the MS-DOS and CP/M 86 operating systems.

I mean, how can you start World War III if you don't know for sure where anything is? You would have to just stooze around in someone's network until something good came up. But there may be a way out, for serious businessmen and happy hackers alike.

Over in Somerset UK, Framptons (Ashcott) Ltd will undertake to locate and provide information about various databases around the world.

The company calls its service "Search and Supply" and the top man says, "Our business is to discover what information is stored throughout the world, find out who needs it, and to supply it."

In order that the much besieged and misunderstood men at ASIO not be encouraged to dive further into the murky depths of paranoia, all the information offered by the Framptons company is publicly available.

One hopes if after this, one keeps looking in the rear vision mirror on the way home from the office it isn't misinterpreted. Truly boys, I'm not a Russian spy, I just don't want a 25 tonne bus in the back.

If it is humane to Ur then 60 can be germane to Honeywell

Honeywell, despite displaying a sense of humour and daring that had never been suspected with its product "Softool", has released two new computers which it sees as being

In front of me walked a construction worker in what looked like Gucci overalls accompanied by a man in western dress complete with sheriff's badge and tied down holsters.

It wasn't too important that the cowhand had a hair dryer in each holster rather than a Colt or Remington 44, as I was armed with a Casio portable computer to protect me from the two handed hair dryer persons.

All this came about because I was walking home to Paddington, a dazzle painted slum of Sydney, carrying my computer and its manuals.

As I left the office it was well after the banks had shut and since I have never mastered the art of getting the automatic tellers to accept my card, I was going to have to foot it home. Having always had trouble reconciling my nett income and my gross habits I had left myself with insufficient funds to negotiate for a bus ticket.

As I passed through the throngs of Oxford Street I was at some difficulty to grasp what it was I was actually doing. The Casio thing that I carried had a much faster cpu cycle time than the IBM 1401 that was preferred to the NCR 315 that I was trying to sell to BHP a decade or so back.

Potentially the Casio portable has a bigger store than the IBM 1401 that BHP bought, but the cpu of the earlier machine would have needed a truck to carry it and here I was walking home with the Casio under my arm. Also the IBM 1401 cpu would have cost something into the hundreds of thousands of

personal ones. The Microsystem 6/10 and the Microsystem 6/20. Thus preserving Honeywell's obsession with the number 60 and its factors and also refusing to allow the memory of the Level 6 computers to die and be granted the



dollars, my Casio would cost under \$500 and it also offered Basic.

My Casio was an 8k model that could have had another 24k added by the user making it much larger than BHP's first IBM 1401. The Casio has some graphics capability which also exceeded the 1401.

Life is strange. What with holstered hair dryers and 1401 replacements that one can comfortably carry under one's arm all the way home and still be able to stop off at Lily's cake shop for a few Rum Babas and a quiche to two.

Now after a week of Casio driving since the hegira along the street of the camp drafters,

I have come to some conclusions. These include that the Casio portable should have the extra RAM available, 24 or 32k would be handy; that it ought to have a reasonably portable printer; and that it needs at least a cassette drive and/or a floppy or two.

All this would lift the basic \$450 price a mite, but would be rather good to play with. Make no mistake, the LCD display and the somewhat limited graphics and the 8k store still allow the able user to have a great deal of power at his disposal. And although the spreadsheet on the LCD display isn't too usable in a real world, it is still fun.

charity of oblivion.

Both of the above systems look rather like smart terminals. At least they look more that way inclined than they are in the PC mould.

Honeywell ends its description of the Microsystem 6/10 by assuring us

that the system on both desktop and floor versions is designed to be as attractive from the back as front.

One other thing that Honeywell says about the 6/10 is that it's intended to be installed by the customer using a screwdriver and a

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If you like kissing your kids goodnight it can give you your chance to leave the office on time. Then again it does have one disadvantage. If staying late at the office was a good excuse to take out that gorgeous blonde you met last week you are going to kill your alibi stone dead. Your wife will never believe you. Sorry about that.

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great deal of (over) confidence.

It happens to the best of us

Honeywell, in the midst of about half a dozen announcements, announced the release in Australia of the "Softool" development product set, and with a straight face too. It would seem to me that the product set would have a high negative response index, but probably Honeywell knows what it is doing with its "Softool", although I really would have chosen another name. "Softool" is a Honeywell registered trademark.

Ten Years with no non-parole

In order that the company's name be recalled to the minds of the labourers in the vineyards of the press, Perkin Elmer delivered us all a bottle of Perkin Elmer ten year birthday port.

Defending it valiantly from the depredations of the unseemly who lurk about such things, I have placed the Vintage 1980 substance in my cellar beneath the bedroom and in the partially dug grave from last century. Sometime about when Dennis Brennan sends port to mark the company's twentieth year in Australia, I'll try the ten years stuff and see how Perkin Elmer's judgment stands up.



Terminal man lives

Perhaps it is time for the biological terminal, for man himself to achieve his destiny as part of a local area network that includes himself and the host computer, possibly another biological computer, and other nodes.

All this 2084 stuff was brought on me when I saw the details of the new Canon X-07 personal computer. It could be carried in the side pocket of a scungy old duffel coat and Canon's A-1210 colour ink jet printer could ride on the other hip to balance. Mind you, you'd have to take the printer's roll off and even Canon couldn't be totally sure that the ink jets don't leak and form a small but irritating pool of

multi-coloured nature for you to put your best pigskin gloves into.

One thing that always goes with a new personal computer is yet another assault on the English language and the X-07 isn't above this practice.

It uses what Canon calls "Softcards" and these offer a sort of hybrid between software and hardware. Rather better than the old and unlamented term "Firmware", but still enough to have Fowler reaching for a Fowler piece.

So far three different kinds of "Softcard" are available for the X-07. These are an 8k ROM, 4k RAMs with another 4k holding business orientated programs etc, and a normal 4k RAM memory card.

There is an RS232C interface and there will shortly be an interface for colour TV monitors.



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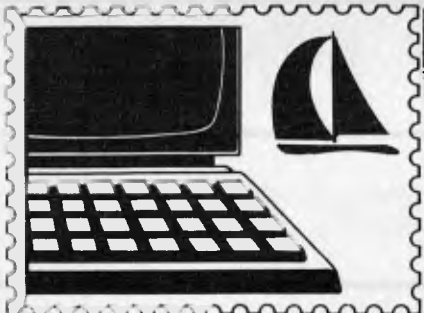
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Back to Basics

Both in the computer press and in personal contacts I am flooded with statements that Basic is a poor language and that Pascal is superb.

The MBasic program shown is the most used routine in several programs that I use for serious purposes.

It would normally be rewritten in machine code for long runs but a high level language simplifies initial testing of the correctness of the logic.

Perhaps some Pascal buff could say how he would write it effectively in Pascal with every bit, in each work, valid and independent.

A long winded solution is, of course, possible but processing every bit separately is incredibly slow.

```

5 DEFINT R,S,X,Y
1000 S1=0:S2=-1:S4=0:S8
=-1
1010X=S(S) AND R:R=NOT
R
1020Y=S(S+1) AND R
1030X=X OR Y
1040IFXTHENY=S1 and
X:S1=S1XORX:X=Y
1050IFXTHENY=S2 and
X:S2=S2XORX:X=Y
1060IFXTHENY=S4and
X:S4=S4XORX:X=Y
1070IFXTHENS8=S8XOR
X
1180:
1190WHILES8: SX=S8
1200SX1=NOT
S1: SX2=NOTS2: SX4=NOT
S4: SX8=NOTS8
1210S1=S1ANDSX8: S2=S2
ANDSX8: S4=S4ANDSX8
1225SX1=SX1AND
S8: SX2=SX2AND
S8: SX4=SX4AND
SX8: SX8=SX8ANDS8
1230Y=SX1AND
SX: SX1=SX1XORSX:
SX=Y
    
```

```

1240IFSXTHENY=SX2
ANDSX: SX2=SX2XOR
SX: SX=Y
1245IFSXTHENY=SX4
ANDSX: SX4=SX4XOR
SX: SX=Y
1250IFSXTHENSX8=SX8
XORSX
1260SX1=SX1AND
S8: SX2=SX2AND
S8: SX4=SX4AND
SX8: SX8=SX8ANDS8
1270S1=SX1ORS1: S2=S2
ORSX2: S4=S4ORSX4
1275S8=0
1280WEND
1285S8=SX
    
```

This routine is the essential of the main routine of several programs. How may it be programmed efficiently in Pascal?

R Silson

Toppled Secret

I refer to the article by George Sassoon entitled "Top Secret" in your August 1983 issue, but more particularly to his remarks that "no easy way of cracking RSA ciphers has been found and it seems unlikely that one will ever be found". You add "APC would be interested to hear actual experiences of breaking it".

It is my guess the article by Sassoon was written about the middle of 1980 or if not has all the elements of very light reading on the topic.

I attach a few paragraphs from an interview Professor C. Deavours had in January this year with partners in a highly successful European company that does, among other things, research and design in the cryptologic field. You will note his remark

that most readers are familiar with the papers demonstrating the fallibilities of the principal public key systems. For your information I enclose another attachment showing how easy it is for a skilled cryptanalyst without having to break the underlying RSA cryptosystem. Unfortunately much of this work is classified but Sassoon's comment that "no easy way of cracking RSA cyphers has been found" is years out of date.

Finally, may I add I find it strange so little is written in a magazine such as yours as to how to achieve data security. Particularly in an era when people are supposedly "privacy" conscious.

John Rodgers

The article you speak of was, in fact, written recently but it's best that George Sassoon reply himself. See below. —Ed.

Top Secret

Further to my article on cryptography (APC August 83), various reports have appeared in the press saying that the RSA public-key cryptosystem had been broken. This was since my article was written. As a result I wrote to Adi Shamir, a co-inventor of the RSA system, in Israel. From his reply, it is clear that these reports were the result of a gross misunderstanding. They arose from a paper which Shamir himself had published, of which he sent me an abstract. *In this, he demonstrates the insecurity of the so-called 'knapsack' system, a rival to his own RSA system. The press took

this to mean that he had in effect publicly shown that his own system was no good!

In fact, the security of the RSA system still rests on the difficulty of finding the two prime factors of a large number. This is a problem that has occupied some of our best minds since the ancient Greeks, and no easy solution has been found to date. Better computers make it a bit easier, but they also make it much easier to use codes with still larger numbers. Users of RSA systems can remain confident of their security unless some truly magical factoring algorithm is devised.

George Sassoon

*Shamir Adi A polynomial time algorithm for breaking Merkle-Hellman cryptosystems (Weizmann Inst, Israel, April 1982)

Macho move

I am often amazed at the novel arguments people think up to justify their attacks on computer games. A case in point is Martin Banks' 'Banks Statement' in the June issue.

The first half is largely devoted to a comparison between computer game playing (of the arcade variety) and such pursuits as drinking competitions and hazardous driving. Martin suggests that the former has replaced the latter activities as a means of allowing young people to prove themselves.

Even if you accept (and I don't) that this accounts for more than a small proportion of computer game playing, I don't see that it is an indictment of the games

COMMUNICATIONS

themselves. The fact that these games are around doesn't prevent you from doing the other things (and in my experience they are alive and well). What it does mean is that you have more choice. Many people, I'm sure, would argue that playing games in which you cannot come to any real harm is preferable to playing ones in which you can.

Martin says that computer game playing removes one from reality. This is true in so far as there are no real Pac-Men or Space Invaders but that is not the point. The skill required to score a million at 'Defender' or whatever certainly isn't unreal and if the games didn't provide some kind of genuine challenge I don't think people would enjoy playing them. The games' scenarios are fantasy, yes, but to object to them on that basis is stupid.

Martin seems unable to accept that computer games need no more justification than the fact that they are fun to play. Game playing, it seems to me, is just as legitimate an application of computers as their use in science, education or other 'real' fields.

Towards the end of his 'Statement' Martin objects that computer games 'help to push individuals down to some level of "lowest common denominator" of intellectual activity or aspiration' and that 'even the games approach can be used to better advantage'. The assumption behind these statements seems to be that all computer games have pretensions to being of some intellectual or educational value whereas, as far as I can tell, most of them strive only to be fun to play — and rightly so. You might as well object to swimming or parachuting (or drinking) on the grounds that they are not educational.

There are, of course, some very intellectual computer

games but they are another matter and have a very different appeal to those of the arcade variety.

To be fair, I do not think the issue is completely clear cut and I'm sure that there are cases where computer games have been positively harmful. But there is strong evidence (their success, for instance) that these games give a lot of pleasure to a lot of people. That is surely something to be grateful for?

Finally, I should point out that I am not saying these things out of self-interest (I don't work for Atari or anything) and write purely as an enthusiast and occasional player. Whatever anyone says, I think the games are here to stay.

Martin Perry

Martin Banks replies

It was with a certain amount of pleasure that I read Martin's riposte to my piece on games in Banks' Statement. It is good to know that there are some out there thinking more general thoughts about home computers and their implications than the size of a memory or address bus.

I do have a suspicion (and I admit it is predominantly no more than that) that many computer games — particularly those of the arcade variety — are not entirely a good thing, and to answer Martin's points on what I wrote, I will try to explain why. I would add that I accept that many people will consider some of my views extreme, and I do not claim to be in any way right. I have just highlighted some dangers and some possibilities.

I do feel that, for many people, computer games have the power to replace such activities as outlined — and many others — and that

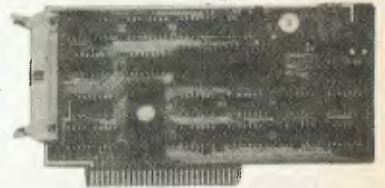
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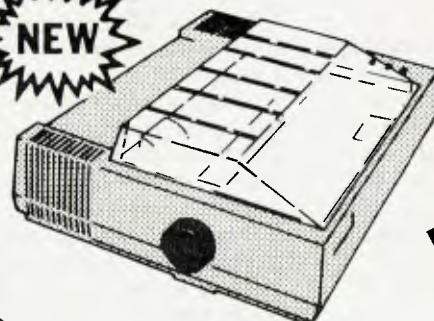
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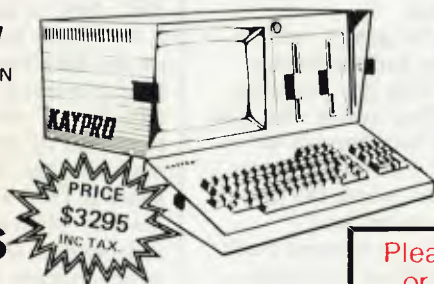
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they are used (as the activities have been used) as a means of 'proving' oneself. I have nothing as such against the games (OK, I don't go for them personally, but that's different) and no, they do not prevent one from doing other things if one wants to. My main complaint, doubt, fear, call it what you will, is that they remove people from reality. Even worse, they can give a totally distorted view of life.

Martin says, quite rightly, that there is often considerable skill involved in playing an arcade game. This means that the game typically tests manual dexterity in intercepting one video image with a moving line emanating from another video image, under operator control. The trouble is, it doesn't sound terribly exciting stated like that, does it?

Say instead that the player is 'defending your galaxy from alien invaders, armed with photon torpedoes and nuclear bombs', and it sounds more interesting.

This is why I refer to the unreality of the games. Swimming, parachuting and drinking are, in fact, more educational than the games, if only because they are 'real'. Do them wrong and you drown, dig a very deep hole very quickly, or get sick for a week.

With the games you are throwing nuclear bombs around with gay abandon, killing God knows who, just because they happen to 'appear'. You can even get five 'lives', where the player can get wasted and miraculously brought back to life without a blemish — you don't even get a mild shock through the joystick to let you know you blew it.

Am I overstating the case? Very probably I am, but I cannot help wondering where such games could lead, and maybe it is better to state an opinion now rather than later. I view the

implied violence of such games with horror, I'm afraid. It is an old saying, but 'violence begets violence' is as true now as it ever was, and attitudes to violence — its implicit acceptance as OK in the form of these games, for example — is an essential part of this. One only has to observe the relationship between violence on TV and film, and its occurrence in real life. The two quite naturally feed off each other.

I accept the following as a paranoid scenario but: we live now in enough danger of some political lunatic (and it is my considered opinion that the vast majority of politicians fit the bill) pressing one or two of the right buttons in a fit of high-principled pique, thus reconstituting all of us. Just imagine how much easier it will be in a few years' time when the lunatics (sorry, politicians) who lead us are drawn from the ranks of those that currently think nothing of 'nuking' whole galaxies by the hundred, and for a cost/effective outlay of only 40 cents.

Yes, I know, I'm just being silly.

Not so slow

I refer to the Benchtest of the NEC APC in issue Number 5, Volume 4. As we discussed on the telephone, we felt that your comments about the APC being "very slow", as measured by your Benchmark timings, are misleading. This is particularly the case when other independent technical commentators have remarked on its high speed by comparison with the competition.

The reason, on closer examination, is quite obvious in that you tested the APC using C BASIC 86 Language running under CP/M-86 and then compared these timings with other

COMMUNICATIONS

machines which were Benchtested using Microsoft Basic.

Whereas you could argue that you only tested the machine using the software supplied, if you are to credibly test any machine you should ensure that the measurement criteria actually measure machine speed and not some indefinite mixture of machine speed and inefficiencies in either DRI or Microsoft languages!! Or if you cannot separate out the languages, at least use the same software compiler to limit the variables.

For your information, whilst running the particular Benchmark programs you use, C BASIC-86 is very much slower than Microsoft Basic. The results of your Benchmarks using Microsoft Basic Interpreter under MS-DOS on the APC are as follows:

B.M. No.	Time
1.....	1.0
2.....	3.6
3.....	7.6
4.....	8.0
5.....	9.0
6.....	16.5
7.....	25.5
8.....	25.0

That's without any Numeric Data Processor (8231 or 8087). I think you will agree that that is substantially faster than your report and most of the APC's competition.

We would be happy to demonstrate these timings to you any time you wish. Meanwhile I would appreciate it if you would publish a correction to the previously published article. We would be quite happy to see a table of Benchmark timings for the APC compared with a range of its competition. We think it would show the credibility of those other commentators who have described the APC as "fast".

Also, Steve Save might be persuaded to believe the

APC deserves 'the honour of "Computer of the Year"' without the addition of an arithmetic board or anything else!!

*Jolyon P. Bone
NEC Information Systems Aust*

PS: The above Benchmark timings have also been confirmed almost identically with Microsoft Basic under CP/M-86 on the APC.

We're waiting on a reply from Steve Save at the time of going to press. —Ed.

Bad advice

In your June/July 1983 issue, a reader T.R. Martin asked about a problem with Newdos 80 disk directories being filled up, yet with lots of room left on the disk. Your answer by P.L. McIlmoyle might have been correct so far as CP/M's limitations are concerned, but missed the boat with respect to Newdos 80.

The Newdos 80 authors were aware of the possibility of large-capacity disks being used, and provided a means to reserve extra-long directory areas. Nor is there any need to relocate the directory, as suggested by Mr McIlmoyle.

Assume that drives 2 and 3 are the 80-track drives. It will be necessary to format a blank disk on, say, drive 3, and then copy all of the data from drive 2 onto drive 3. The original copy of the disk can then be discarded or saved as a backup.

The Newdos 80 procedure is as follows: From DOS, type PDRIVE 0. You should see a large incomprehensible table appear. The important feature here is the column called DDGA=2. This means that only two granules have been allocated to the directory, which is more than enough for 40-track disks but obviously not for 80-track units. To reserve 3 granules for drive 3, type: PDRIVE 0, 3, DDGA=3, A

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This command translates as: for the system disk in drive 0, change the listing for drive 3 to read 3 directory granules, and then accept the change immediately without rebooting. (You might want 4 granules!)

As a precaution, tell the system VERIFY Y.

Now tell Newdos to copy with formatting from drive 2 to drive 3 as follows:
COPY 2, 3,,FMT,CBF

Repeat this procedure for every pair of old-disk/blank-disk to be converted to a longer directory format. Then fix up the system disk so that both 80-track drives will have the longer directory size:

PDRIVE 0,2,,DDGA=3

Jay Mann

your tasks with very little "re-education" and have portability to boot.

John Benfield was intrigued with track-balls: they contain two devices at right angles with rollers in contact with the bottom of the ball itself. These devices spin a wheel which has holes in it with a LED behind the wheel. A simple sensor picks up the "strobe" thus detecting speed or momentum of the ball. Similar to a joystick to program, the track ball provides far more accurate positioning and movement. For further information about this device and a more complete technical description write to MS Industries, Connecticut USA.

I trust the staff will spend more time answering users questions from now on and remain yours sincerely,

G N Leith

Under attack again

I read your publication with enjoyment almost every month, but find it most annoying when earnest readers ask questions and receive totally unsatisfactory replies.

On the two occasions in the Communications section in the August edition when questions were proposed, the answers were vague, uninformative and incorrect in their entirety. Both P L McIlmoyle and Len Warner are severely wrong in their mode of answering. If you don't know the answer to a reader's question, then research the subject and answer it when you know.

In answer to P Bagnall's question: you will need a programmable calculator with scientific functions as standard. You will not find a suitable "dedicated" machine for your purposes. Try a HP programmable or if you are more suited to the Algebraic Operating System then invest in a TI or the Sharp range of Basic programmables. You will thus be able to program

More help please

I would appreciate your publishing this plea for help in the "Communications" sections of your magazine in the hope that a reader may have overcome the problem that I have been experiencing.

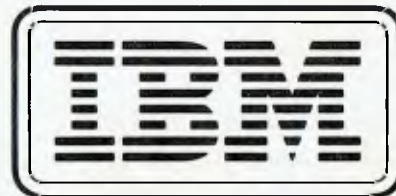
I have a System 80 to which I have attached a TC8 Cassette Operating System via a Syspand 80 bus converter. The system will only enable switching of the remote cassette motor and not transfer of programmes or data. The TC8 has been tested and operates perfectly on the TRS-80. I removed the Syspand 80 and connected the TC8 directly to the System 80, but the result was the same.

It would appear that I have a software problem with the driver routine for the TC8. Can anyone please help?

M J Moore

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Basically a better 64

Can Simons Basic calm Susan Curran's love-hate relationship with the Commodore 64?

Of all the micros I've used, the Commodore 64 is my least favourite, in spite of its great graphics and sound potential. When you sit down to bash out what should be a half-hour program, you end up tearing your hair out three hours later as the computer carries on doing anything but what you intended.

One obvious problem is the built-in Basic, which may have been fine in the early Pet days but now looks extremely sparse. It has no support for the hi-res graphics and sound. Patient 64 owners have been waiting for months as Commodore debugged its advanced Simons Basic—rumoured to more than make up for the shortcomings in the built-in version—and put it into secure cartridge form.

Features

The Basic certainly has all the features it was rumoured to have, and more than enough to knock the stuffing out of the independent programmers' toolkits which have been filling the gap over the past year. There are 114 additional commands, and most of them are well worth having. The entire list is summarised in the table.

There are 19 general entering/listing/debugging/program securing commands, filling most of the gaps in the original Basic. KEY assigns up to 15 characters to each function key, and DISPLAY gives you a directory of the assignments you've made. RENUMBER is unusually limited, since it doesn't bother to correct GOTOs or GOSUBs.

PAUSE stops the program dead for a predefined number of whole seconds only. It disables the STOP key, but can be broken into by a RETURN. CGOTO is an unusual computed GOTO, using variables in computing the line number.

PAGE, OPTION and DELAY respectively enable you to control the number of program lines listed at once, to highlight Simons Basic commands, and to change the scroll speed. FIND prints out the numbers of lines including a tightly-specified (even leading spaces count) string.

DISAPA and SECURE are used together to blank out specified program lines, in order to secure a program in which they've been used, you simply get a succession of blank line numbers. Very neat stuff. OLD cancels the effect of NEW.

A good, though unusual range of string handling commands seems particularly oriented to word processing. There's even a CENTRE command (centres text on screen) built in. DUP is the equivalent of Microsoft's STRING\$. ATs after PRINT can be strung together as in Sinclair Basic. USE enables you to select print formats for numeric data.

Structured programming enthusiasts can breathe a sigh of relief—REPEAT . . . UNTIL is here, as well as IF . . . THEN . . . :ELSE: . . . (with a weird syntax), and RCOMP, a sort of multiple IF . . . THEN . . . :ELSE: . . . A structure new to me, LOOP . . . EXITIF . . . END LOOP, is somewhere between REPEAT . . . UNTIL and WHILE . . . WEND (which isn't included). You can put multiple exit conditions anywhere inside the loop.

There are two different kinds of named procedure, open and closed, broadly corresponding to GOTOs and GOSUBs. These can be nested up to nine deep. Local variables can be defined for use inside procedures, but there's no provision for passing parameters to procedures. I was sorry to find this missing. Procedure names can be of any length, so long as they fit onto the program line, and can consist of more than one word.

There's a fairly good ON ERROR set of commands, though the errors that can be reported don't, oddly enough, include those unique to Simons Basic. STOP doesn't trigger ON ERROR, and there is no ON BREAK sequence. I would have found one very useful for turning off sprites, which otherwise linger on as shady ghosts at the end of a program run.

FETCH is a great command. It enables you to specify the number and type of

characters (shifted or unshifted, alphabetic or numeric) that you want to receive as input. Invalid input is simply ignored. ON KEY is another useful input validation command, a sort of specialised menu-oriented ON . . . GOTO. (No point using RENUMBER after this one.)

Four tidy commands read input from light pens, paddles and joysticks. The JOY(stick) command doesn't cover selection of a joystick, nor did the manual mention which of the two ports it reads by default. Strange, since the POT command (for paddles) does so.

One of the good features of the original Basic is that the graphics aren't mode-bound. You can, if you are prepared to put in a few hours of programming effort, mix text, high resolution and medium (multi-colour) resolution graphics on the same screen. I didn't expect Simons Basic to support this, and it doesn't. High and medium resolution are rather awkwardly linked together, and the same commands can be used for each, but moving from hi-res to multi-colour mode corrupts any hi-res plotting already on screen.

The text screen is completely separate. You can write a text string on the graphics screen, and increase its scale vertically, but the Basic doesn't let you include variables in the statement, so it takes some acrobatics to get, say, a game score on screen.

The range of hi-res commands is very good. It includes line, point, rectangle and circle (including ellipse) commands, as well as an ARC command. Curiously, only the latter lets you specify dotted lines. An unusual ANGL command draws radii of an invisible circle, like spokes of a wheel. There's a rather clumsy DRAW command for drawing irregular shapes, and ROT, used with this, lets you scale and rotate them. PAINT is slow-moving, as always, but BLOCK lets you draw solid rectangles more rapidly.

There is another good range of screen handling commands for use with the text screen, including FLASH, FILL to fill screen areas with specified characters, and MOVE to duplicate screen sections else-

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where. The sectional scroll is supported. There's a memory dump command (SCRSV, and SCRLD to reload) for the text screen, but no comparable one for the hi-res screen. However, two parallel commands let you print a hard copy of either type of screen.

The sprites (or MOB's — 'moveable object blocks') are duly supported. High level commands cover defining them, moving them, clearing them, and the collision detection features. There's a similar DESIGN command for normal user-defined characters.

The sound commands, described under the heading 'Making Music', are fairly comprehensive, and quite straightforward considering the complexity of the hardware they are controlling. What is lacking is a basic SOUND-type command which you can use without going through the palaver of defining envelopes and waveforms. As it is, you have to use five different commands, VOL, WAVE, ENVELOPE, MUSIC and PLAY, in order to emit even a simple beep.

Presentation

The clearly labelled cartridge comes in a box, with a large format, ring-bound manual.

The manual is spread out on good quality paper and comes in narrative form, with longish example programs covering whole ranges of commands. There is an index, but no ready-reference section, so

checking on syntax involves a lot of thumbing through.

The manual reads well, but on closer acquaintance it proves to be a depressingly familiar Commodore job, full of silly mistakes. Often the syntax was inadequately explained, and sometimes the manual was wrong — the screen and border numbers following COLOUR, for instance, were reversed. Any user would need to resort frequently to the Programmers' Reference Guide to make sense of the murky passages, and in comparison with that, this came across as superficial and simple-minded.

In use

Getting started is no problem, you just plug the cartridge in. As it tells you on power-up, it leaves you 30,719 bytes of memory to play with.

Most of the commands are well thought out, and compare reasonably well with similar commands on rival micros. I've tried most, but not all of them, and with few exceptions they worked as promised.

I found the colour commands confusing, however. There are half a dozen different ways of changing the colour on the graphics and text screens, and these interacted in unexplained ways. I couldn't make the sample program for the FILL command (which was supposed to generate random coloured blocks) produce any colour changes at all after NEWing, for instance. I had to reset the computer before it would work.

SAMPLE LISTING

Designing a Sprite (MOB)

```

100 DESIGN 0,63*64
110 @.....BBB.....
120 @.....BBB.....
130 @.....BBBB.....
140 @.....BBB.....
150 @.....BBB.....
160 @.....BBBBBBBB.....
170 @.....BBBBBBBBBB.....
180 @.....BBBBBBBBBBBB.....
190 @...BBB.BBBBBB.BBB.....
200 @...BBB.BBBBBB.BBB.....
210 @...BBBBBBBB.BBB.....
220 @...BBBBBBBB.BBB.....
230 @.....BBB.BBB.....
240 @.....BBB.BBB.....
250 @.....BBB.BBB.....
260 @.....BBB.BBB.....
270 @.....BBB.BBB.....
280 @.....BBB.BBB.....
290 @.....BBB.BBB.....
300 @.....BBB.BBB.....
310 @...BBBB.BBBB.....

```

Line 100 designates a type of sprite ('0' for high resolution), and sets aside a block of memory to store the sprite data. The remaining lines describe the sprite. The Commodore 64 has a good screen editor, so you can quite literally design the sprite on screen while writing the program. For multi-coloured sprites, letters C and D are added to describe the two additional colours. The main sprite colour is selected when you allocate the design to a sprite register (with the MOB SET command), so you could have eight different versions of this man, all in a different colour. All very neat, though rather heavy on memory requirements.

A more disconcerting problem came when I tried the sample sprite program. As soon as I tried to run it, it appeared to 'auto-destruct'. Up came an error message (my mistake), and when I tried to list the program to correct it, nothing was there at all. Once I'd got a debugged version working from tape, I still found that it only worked once. Re-running it drew a complete blank.

A little research suggested that for some unexplained reason, the program was reserving for the sprites the very start of the user program memory, presumably where the program itself was stored. Overwriting the listing to store the sprites may be memory-efficient, but it is hardly sensible.

In general, I found the failure to link the Simons Basic manual with the rest of the Commodore 64's Basic reference material disconcerting. The Simons sprite designing commands, for instance, are beautifully clear and easy to use, but ridiculously memory-hungry. It takes 22 or more lines of program, with up to 25 characters to a line, to define a single sprite. Direct reference to the more advanced, memory-

Simons Basic commands

KEY	DISPLAY	AUTO	RENUMBER
MERGE	PAGE	PAUSE	
OPTION	DELAY	FIND	TRACE
RETRACE	DUMP	COLD	OLD
RESET	CGOTO	DISAPA	SECURE
INSERT	INST	PLACE	DUP
USE	CENTRE	AT	LIN
FETCH	INKEY	ON KEY	DISABLE
RESUME	MOD	DIV	FRAC
%	\$	EXOR	DISK
DIR	COLOUR	HIRES	MULTI
NRM	HICOL	LOW COL	PLOT
LINE	REC	CIRCLE	ARC
ANGL	BLOCK	PAINT	DRAW
ROT	CHAR	TEXT	TEST
CSET	LEFT(scroll)	RIGHT(scroll)	UP(scroll)
DOWN(scroll)	BCKGNDS	FLASH	OFF
BFLASH	FCHR	FCOL	FILL
MOVE	INV	SCRSV	SCRLD
COPY	HRDCPY	DESIGN	@
CMOB	MOB SET	MMOB	RLOCMOB
DETECT	CHECK	MOB OFF	MEM
IF..THEN..ELSE	REPEAT..UNTIL	LOOP EXIT IF..	END LOOP
PROC	CALL	EXEC	END PROC
RCOMP	LOCAL	GLOBAL	NO ERROR
ON ERROR	OUT	WAVE	ENVELOPE
MUSIC	VOL	PLAY	SOUND
PENX	PENY	POT	JOY

efficient ways of doing the job would have been a good idea.

In general, the commands seemed to work with reasonable, though not incredible, speed.

Once I'd learned to avoid some of the obvious pitfalls, things began to look much brighter, and I did manage to turn out some decent graphics programs in far less time than it would have taken (had I dared to try) on the basic machine.

Reliability

Simons Basic does stretch to ten additional error messages, not really enough for 114 commands. The sprite error message 'BAD CHAR FOR A MOB', used as a catch-all for just about every mistake I could make, was particularly exasperating, as it didn't relate efficiently to the line on which the error occurred.

On the bright side, OLDing my program after a COLD reset nearly always worked. Once or twice it came up with a previous program after I'd been trying in vain to load a new one.

Verdict

This has to be mixed. The Commodore 64 is capable of such a lot, and Simons Basic

makes an extremely impressive attempt at supporting its capabilities. But at the same time, turning the capabilities into solid performance using a high-level language remains a problematic business, and at several points it seems that the sheer complexity of the hardware defeated David Simons' ingenuity. On the whole, I would have preferred 50 rock-solid commands to 114 problematic ones.

But if you have a Commodore 64, and want to program it, then this package really

is a must for you. I can't imagine that any independent producer could offer anything to touch it, and it will put a lot of sprite-designer and utility packages onto the remainder shelves.

If Commodore had only taken the trouble to document it adequately, pointing out any known bugs so that programmers can work round them, I would have recommended it with far less hesitation.

The recommended retail price is \$80 from Commodore dealers.

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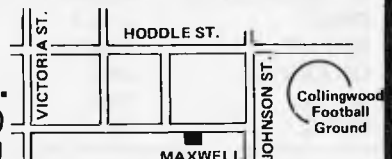


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COMPUTERISING YOUR BUSINESS

Michael Becket gives helpful advice on how to introduce a computer into your business.

Before you install a computer, consultants used to warn companies, your office organisation must be made logical, systematic and consistent — and once you have done all that you probably do not need a computer. But that was before the advent of minicomputers. Then the cry used to be that every fourth person you employ should be a computer.

With the arrival of cheap micros it has changed again: now there are few businesses, no matter how small, that can justify not owning one. Except for the problems. Because if you get it wrong, no matter how little the electronics cost, it can make an expensive hash of the company: bills are wrong, information hides, and stock control evaporates. Or worse.

So what do the experts tell us now? It is the same advice for business machines as for home computers and sounds reasonable and right — the sensible way is to pick out the applications you really need, find the best sort of software to run it, and only as the final decision do you pick the computer to run the programs you have chosen.

Alternatively, if there is nothing strictly suitable, there are professionals who will write tailor-made software for sophisticated needs so one only need find the person/firm specialising in that area and commission the program suite. This is not really feasible for the small business as made to measure programming is fearfully expensive.

Having found the perfect software which does everything you have always dreamed of, from producing cash flow forecasts to compiling a shopping list, one need but look around to see which chunk of electronics runs it most quickly, efficiently and economically. And bingo, you are on the way to organised riches. Right?

Wrong. It sounds wonderful and even logical, but it just does not work. T H Huxley once said the history of science was the slaying of beautiful theories by ugly

facts. So it is with buying computers.

Illusions

For a start, somebody who has never used a computer before finds it almost impossible to specify just what he wants. But even if he does know, how in heaven's name is one to specify it with sufficient precision to enable anybody, much less a beginner, to sort out which highly-advertised set of programs can do it best? It is very easy to tell if one lump of tangible kit is different from another: there are specifiable characteristics. This one has 48k of RAM and that one has 128k. You may not know precisely what it means, nor how much it should have, but at least you can tell them apart. If one machine has two floppy disks containing a maximum of 1.2Mb while another costs more yet has only 600 kbytes, you know one gives you more for your money.

Programs have no measurable characteristics. They do have facilities but until you have used them, it is impossible to tell whether the highly-touted fancy gadgetry is necessary; and more to the point you do not discover until using the damn things that what you do want to do is impossible.

Take a very simple example. Some word processing programs allow pretty clever doings: you can substitute words throughout the text, shift paragraphs, change the margins and so on. But if what you really want to do is set the text in two or more columns, many of the best known ones will not let you do it. Unfortunately it is not until you have used the program for some weeks that the notion occurs and by that time it is probably too late. Or if you find it impossible to tell the size of a number without the commas for thousands and millions, you will not like Supercalc, yet nowhere do you see that little quirk mentioned.

When it comes to complex packages like accounts the problem is considerably

greater. I have started a small publishing company and decided to put the accounts onto the computer. Being methodical, I prepared a list of the accounting requirements of Smith Books, drawn from a prolonged analysis of the way I do things at the moment. It did not follow slavishly the mechanical method — that would have been silly — but it ensured everything now available would continue to be so. Here is what I came up with:

Order processing

A — from an input of customer name and address, number and type of goods ordered, plus discount, the program should produce an invoice.

B — simultaneously the computer should debit the customer's account and adjust stock levels.

C — this should be able to cope with non-standard orders (eg, not an established customer but a one-off requiring no new file), with up to five discount rates, and if required it should at the time of invoicing be able to produce a list of previous orders from that customer indicating which have been paid and total the rest to a statement.

Management information

A — sales per month of each line by number and by value.

B — total value invoiced during a stated period.

C — total cash received during stated period.

D — total of outstanding debtors.

E — list of debtors owing for more than 30 days, classified by size specified.

Continuous information

A — ability to find customer by name and by town.

B — ability to pick out large volume customers.

C — ability to aggregate some accounts for statements (common ownership).

Audit

A — the system should provide all necessary information for statutory audit.
B — it should leave clear audit trail.

This may seem excessively pernickety but since very nearly everything can now be done with comparative speed from five exercise books, I naively thought a clever computer could do it with ease. Not so. Some very clever people including software companies and computer consultants said it was too demanding and I would have to write my own software, probably using something like a database package to help. For a man who broke his basin and almost severed his big toe trying to decorate the bathroom, do-it-yourself holds few attractions; trying to produce anything as complicated as an interlocking set of programs to carry out all those tasks is clearly beyond me.

Step by step

But this is jumping ahead. The first question really is: what software do you really need. Experience has taught one useful lesson — a spreadsheet is essential. In case anybody reading this does not consult the back of this magazine or comes to it completely raw, it may be necessary to explain that a spreadsheet is in effect a squared sheet of paper in which you can tell the computer to manipulate the figures in one square and put them in another.

Anybody who has ever gone through the torture of preparing a cash flow forecast will go dizzy with joy when first starting to play with it. No longer do you sit there all weekend with pocket calculator in hand trying to remember what base rate is and when you have to pay certain bills. No longer do you agonise about the insertion of a sale figure for June, in case it turns out too pessimistic and you have to do the whole thing all over again. No longer do you have to curse the know-it-all who says: 'Yes that's very good but what if, as I suspect, interest rates rise in October?'

You just feed in the assumed sales along the top, tell the computer to multiply each one by price (specified), add on costs such as postage (multiply that and that by that and put the figure here), take costs from receipts and add the total to your bank balance (which in turn is adjusted for the interest rate). And oh the joy of saying 'Ah but what if...' and changing a couple of figures to make the computer work it out all over again at the press of a button.

No business can prosper without a cash flow forecast and in these tough times it is doubtful if it can survive. Bank managers are rather keen on them too. They are comforted by figures, no matter how spurious. And the company itself should get used to producing monthly management accounts to give you an idea where you stand. These are then fed into a

parallel set of figures to your forecast and the two compared to see where the forecast went wrong. The advance warnings about money problems can save you from insolvency.

Word processors — although popular — are probably only necessary for organisations which have words as their main product: consultants, solicitors, surveyors, etc. They are also useful for maintaining mailing lists and also for marrying them to standard letters. For most companies, whose main use would be for letters, a typewriter is probably just as handy. There is the point that once you have bought a computer for other purposes, and decided to get a daisy-wheel printer for its output, it is probably cheaper to buy a word processor package than a typewriter. Since few companies would want to be without a typewriter, the answer may be to buy an electronic one which can be used as the printer of the computer. Then you still have the option at a later stage of buying a word processing package if you really cannot do without one.

Accounting packages are not so much essential as the main reason for buying a computer in the first place. Here you are going to be completely at sea. For any popular computer (for example, my own Sirius) there is a bewildering choice of packages. If there is a way of telling apart the products of IMS, Sybiz Software, The Software Works or Padmede, I have not found it. (I did not make up that list — that was not heavy-handed satire, those really are purveyors of accounting software to Sirius owners.)

Get advice

The answer is to talk to as many people as possible in the game, from dealers to distributors. On top of that you just have to read magazines which do reviews. No they will not ask the questions you do because reviewers do not run small business on the program for six months as a way of testing them, but you will get a comparative feel.

You will also find special suites of programs tailored for specific industries. Pubs to publishing, retailing to road haulage, solicitors to shipping, there are hundreds of them. Everything from corner shops to multimillion dollar organisations can find off-the-peg packages. Check them carefully — many are partial solutions to a sector's problems and you may still have to add on so many other (non-compatible) bits and pieces that the original specialist service may be less than useful. To be fair though, some are economic ways of solving a small problem, and can be run on low-cost computers like the Apple, Commodore 64 etc.

Accounting packages come in separate

units: sales ledger, debtors ledger, creditors ledger, payroll, stock control and general ledger. You can get these piecemeal from around \$650 a time and this will help spread the cost and the labour of transferring files. But make sure the units interlink and have enough capacity for your number of customers. There are also some complete packages but either way you can expect the whole lot to cost between \$1,000 and \$3,000. A higher price is not necessarily an indication of greater quality.

Finally, the only other type of software you are likely to need is database management. This piece of computer-speak means access to information. It will for instance enable you to enter all customer names and then call for them with few facts — eg, Mr Jones, Sydney; or a retailer in Brisbane who orders doorstops; or customers in Perth who order in large quantities and so on. It can also allow you to manipulate your information and so can build up your own programs, even accounting suites. Probably the best known one is dBaseII, but clearly this is a luxury at the start, especially as it is likely to cost upwards of \$800.

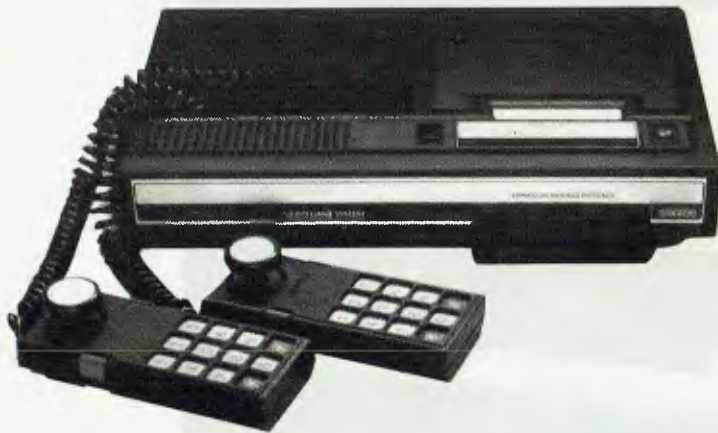
Every company's detailed needs are different, but the essentials are much the same. Financial planning and running the books are vital and computers can make both less time consuming and more accurate. Companies which are now small and have no megalomaniac ambitions (I do), like a shop or a pub or a garage or a small manufacturing concern, can probably make do with a fairly low cost system — the programs for home computers are enviably cheap. But once you get a proper business system (you will find disk storage pretty well essential for both types), costs rise to \$3000 and up.

Warning

Two final warnings: it is going to take a long time to learn the systems, and do not get rid of your paper system just yet. Even the most 'user-friendly' programs have to be learned — you can get the hang of spreadsheets like Supercalc (which I use) and the popular Visicalc in a matter of an hour or so but it took me something over eight hours to master WordStar (the word processing package on which this article is written), and dBaseII can take weeks to understand fully. And until you have got the hang of shifting things around the computer you will almost certainly foul something up, lose a file or just fail to get at the bit you want. So for the first year run the two in tandem, and make sure you buy from a dealer who will hold your hand when the bloody thing refuses to obey you — as it will.

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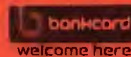
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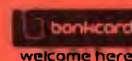
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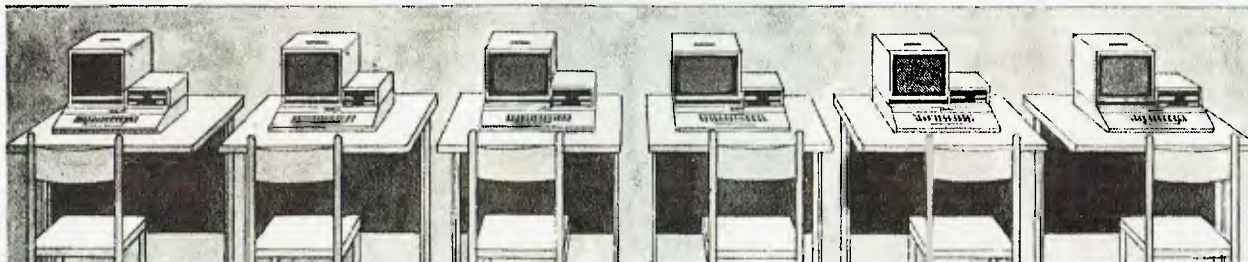
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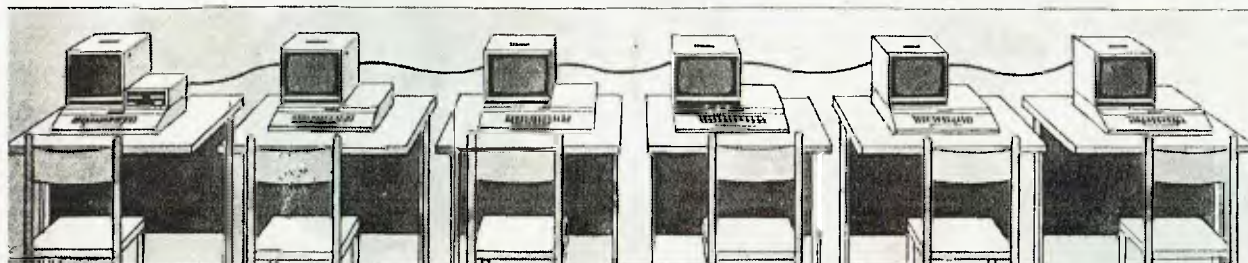
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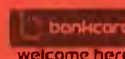
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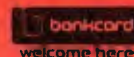
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Sol Libes presents his monthly round-up of news and gossip from the Big Apple.

Apple doings

Apple Computer is continuing to wage its battle against Apple II clones. The latest are three lawsuits filed against Jade Computer Products, Hawthorn CA, Cosmic Computers Unltd, Diamond Bar CA, and Ironsides Computer Corp, Reseda CA. Apple is charging them with copyright and patent infringement and unfair competition. Apple claims that all three companies are marketing units and software which are virtually identical to the Apple II.

In the meantime, the shortage of IIe's which existed in the first four months of the year is no more and in fact Apples are now in abundant supply which has triggered a price war. The Apple IIe system, which includes a monitor and display, lists for \$1995 and is now being offered by some discounters for as low as \$1599.

The Apple III has certainly not been a success story for Apple. However, the company appears committed to the III. Apple has already established 135 of its 1500 dealers to carry the Lisa and all of them have already received demo units with customer shipments expected later this summer. Apple expects to increase its Lisa dealer base to about 300 by this time next year. The company is relying on its own national accounts sales force for most Lisa sales. Apple is also expected to do a large OEM business with the Lisa (Apple already has over 100 OEM accounts).

Apple's next big effort is

expected to be in local area networking for all of its products.

Random rumours

There is industry speculation that Compac, the company that to date has produced the most IBM PC compatible machine, may follow that up soon with a notebook-size version of the computer using a 24 line by 80 character wide gas plasma display. Also, the company is expected to 'go public' later this year. . . An Apple IIIe is expected before year end. . . And Tandy is expected shortly to release an IBM PC compatible at significantly less cost. . . There are also rumours that IBM will soon release an in-house developed DOS for the PC which will be more upward compatible to IBM disk operating systems used on their mainframes instead of the current Microsoft direction of providing upward compatibility to Xenix. . . Commodore is expected to drop the list price of the model 64 to under \$200 and introduce a stripped down 64 with a list of under \$150 for the Christmas season. Also look for a 16k version of the VIC-20. And rumours abound that Commodore will soon do away with the P-series of computers and introduce a \$100 low-capacity disk drive. . . International Telephone and Telegraph is rumoured readying a personal computer entry at its Qume division. . . Spectravideo is rumoured readying a lap-size portable computer which is a souped up version of the Tandy 100 at, naturally, a lower cost. . . Microsoft is expected to introduce shortly versions of

Xenix for the IBM PCXT and DEC Professional 350 personal computers. . . There are hot rumours that both IBM and Apple will launch their home computer this fall. Both are expected to be stripped down versions of their PC and IIe standard models, to include disk drive, 64k of RAM and to be transportable (in other words have handles, be slim and weigh under 30lbs). The selling prices are expected to be in the \$500-600 range.

New war in software

Manufacturers and retailers had hoped to make their money on selling software at list price while discounting the computers to near cost. However, now the price war appears to have spread to software as well and manufacturers are bundling more and more software in with the basic machine. Further, manufacturers are beginning to drop prices on software in the same way that they dropped prices on hardware. Commodore, for example, has recently begun selling game software at \$10, which previously sold in the \$20-35 range and business-oriented software such as spreadsheets and database programs in the \$50-100 range where previously they sold for several hundred dollars.

Software is now merchandised in much the same manner as audio records and tapes. There are specialised software stores and software has even begun springing up on the racks of drug stores. Distribution is now done through distributors (*à la* records and magazines) and no

longer from manufacturer to dealer.

Japanese seek computer standard

Fourteen Japanese and one American company are reported to have agreed to adopt a computer standard developed by Microsoft. The standard relates more to the home computer market where the Japanese have as yet had no success in penetrating the US market-place. The standard would allow for software and peripheral compatibility and is referred to as MSX. It requires a Z80 based CPU, the TI-9918 graphics controller, the General Instruments sound chip, 64k of RAM, 32k of ROM (containing Microsoft Basic and a minimal operating system), a quadrature joystick and an NEC cassette interface.

The companies agreeing to the MSX standard include Canon, Fujitsu, General Corp, Hitachi, Mitsubishi, Pioneer, Sony, Toshiba, Sanyo and Matsushita. The one US company is Spectravideo. Digital Research, developer of CP/M, has also stated that it is developing a standard.

Bad times hits PC business

Texas Instruments has disclosed that as yet it has never made a profit in the personal computer business. This follows a similar statement made by Atari earlier this year. Actually TI has never been successful in consumer electronics. Its efforts in digital

YANKEE DOODLES

watches and calculators were also serious disappointments.

Atari, whose market share of the game business has slipped from 80 per cent to about 40 per cent and who at one time was number 1 in the personal computer business and is now in third or fourth place, is going through a 'consolidation' and 'reorganisation'. During the past year it has eliminated some 2000 jobs in the US and shifted manufacturing to the Far East, Puerto Rico and Ireland.

TI ordered a two-week 'vacation' for all its consumer group employees, has closed all of its retail stores and is expected to have a new round of price cuts (which intensify the current price war even further). It is estimated that TI currently has over 200,000 computers in dealers stock, another 200,000 units in its own warehouses and a similar quantity in parts for production. Thus there are predictions that TI will soon begin dumping these units on

the market at substantially reduced prices.

In the meantime, Apple and IBM are reported talking to mass merchandisers about marketing new stripped down versions of the IIe and PC. They are both trying to enter the larger home computer marketplace without upsetting their dealers.

Latest in the price war

I could hardly believe my eyes, but there was the ad in my local paper... the Timex 1000/Sinclair ZX81 on sale for \$29.97... how much lower can it go? And then the same store advertised the Commodore 64 for \$199.97 and there are reports of prices as low as \$194.99. And the VIC-20, Atari 400 and TI-99/4 are fighting it out at the \$69 level.

Price erosion has even begun

on the more expensive machines. For example, I recently saw a newspaper ad for the Osborne I computer for \$988. And there are special discounts being offered on the Apple IIe when bundled with peripherals and software, so that the effective street price of the machine is now down to well under \$1000.

Random news

Fortune Computer Systems, the first company to introduce a 68000-base Unix system, will announce a loss for the second quarter ending in July. Fortune attributes it to a drop in orders and delays in software shipments... Shugart is expected to introduce a 12in optical-disk drive later this year with a one gigabyte storage capability. Price is expected to be close to \$15,000... Digital Equipment Corporation has disclosed that it will abandon

production of 36-bit minicomputers in favour of its 32-bit machines... Computerland has filed a suit against Softwareland seeking to have the company stop using the suffix 'land' in its name... Computers International, Los Angeles CA is reportedly at work on a 100cps daisy-wheel printer... Tandon Corp, the disk drive manufacturer, will enter the personal computer market with a system sold under a private label by Atari... Romox, Campbell CA, has demoed a reprogrammable game cartridge with the expectation that customers will bring their old Romox game cartridges back to their dealers to have them reprogrammed with new games at \$10 each... Microsoft has named a new VP of corporate communications (that means PR) who comes from a soap company. Guess it needs its act cleaned up.

END



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A BEGINNER'S GUIDE TO PROGRAM CONVERSION

This month Surya provides some direction for those trying to get to grips with program conversion. Next month, hours upon hours of blood, sweat and tears will come to fruition in the presentation of APC's Basic Program Converter Chart. It's a compilation of the Basic keywords of popular micros set out to enable equivalent words in your micro's dialect of Basic to be used in their place.

When you've just picked up your copy of APC and spotted a nice little cassette-based database for the TRS-80 it's very tempting to sit down in front of your VIC 20 and start tapping away, altering lines as you go and hoping that it will run when you've finished it. Unfortunately, while you can sometimes get away with this on very short programs, anything longer than twenty or thirty lines and you quickly find yourself in a mess. The first rule of program conversion is stop and think! This brief article is not a definitive guide to program conversion, but it should give a few pointers to those relatively new to the game.

So where do you start? Well, first of all think about whether a conversion is really the best approach to the problem. Although modifying an existing listing may sound easier than writing the program from scratch, this is not always the case. In choosing between a conversion and a complete rewrite, there are a number of factors to be considered:

(a) The compatibility of the machines.

Some machines support very similar dialects of Basic: the TRS-80 and the System 80 for example. In a number of cases, the program may require only a few minor changes here and there to enable it to run on a similar machine. You may even find that no changes at all are needed.

Other machines, however, are almost entirely incompatible. Converting from a Commodore machine, for example, with its cursor-control statements embedded in the text, can be a real pain. Equally, converting from a powerful machine to a lesser beast may cause problems: a Basic with recursively-defined procedures (procedures within procedures) and REPEAT-UNTIL loops can be very difficult to rewrite efficiently for a machine which doesn't support a structured Basic.

Although converting from a simple

machine to a more sophisticated one is generally easier than the other way around, you will be sacrificing the features for which you bought the machine. Any ZX81 listing will run on a Spectrum, but then what's the point of having a Spectrum?

(b) Sound and graphics.

However compatible machines may be in other respects, they usually bear not the slightest resemblance where sound control and graphics resolution are concerned. Where a program relies heavily on these features, therefore, rewriting the program from scratch would probably be easier than attempting to modify it.

(c) Machine-code, assembler, PEEKs and POKEs.

Any program relying heavily on machine-code or assembler, or where a significant amount of PEEKing and POKEing is done, will be extremely difficult — if not impossible — to modify for a different machine. Anyone who knows enough about low-level programming to do the job would almost certainly be able to write their own routines in a fraction of the time taken to convert someone else's.

(d) The structure of the program.

I must confess a sneaking sympathy for the view that 'all that matters is that it works'. When I'm writing ordinary day-to-day programs for use around the office or whatever, my programs are neither elegant nor structured. Having publicly owned up to this fatal flaw in my otherwise perfect character, I am now going to sing the praises of structured or modular programming.

Structured programming is the art of assigning each component function of the program a routine of its own. Take the example of a simple database, there would be one routine to display the menu, another to accept input, another to sort data, yet another to output data to a

printer, and so forth. Each routine, or module is entirely independent of any other, being called by a central 'control' module. You could, for example, remove the printout routine simply by deleting a solid chunk of code and deleting the option from the menu. The rest of the program would be totally unaffected.

A well-structured program is not only easy to read and edit, is also lends itself to modification for a different machine. If (say) the bar-chart section cannot be used on your machine because of the difference in screen-addressing, you can simply replace it with your own routine without necessitating all kinds of changes in other sections of the program.

If a program is very badly structured, it is often easier to write your program rather than wading through GOTOs, attempting to follow a logical path which jumps in and out of loops and so on, and altering one part of the program may have unforeseen effects in a completely different part.

(e) The program as a whole.

Does it do exactly what you'd like it to, or merely approximately what you want? There's little point in modifying an exciting program if you're then going to have to spend a lot more time on it in order to get it to do something else.

Do you understand the way the program works? If you don't, then not only are your chances of carrying out a successful modification pretty slim, but the program may not do what you thought it would even if you succeed!

By this stage, then, you should have decided whether you're going to modify the program as it stands, or write a completely new program of your own to do the job. If you decide on the latter, it doesn't necessarily put you right back at square one. The general structure of the program may provide a good starting-point, and you may also be able to incorporate some of the routines into your own program. Treat the original

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MSX AND LOGO.

It is now history that, on June 15 1983, Spectravideo, Inc. joined with most of Japan's largest electronics firms to launch MSX: The most far-reaching personal computer standard in history. MSX is the name given to a specific hardware/software configuration that makes product interchangeability possible. While Spectravideo is proud to participate in MSX, we are even prouder of this fact: It was our own SV-318 computer that was used as a prototype for the MSX design! There are two important aspects to this.

First, all future MSX hardware—i.e. computers, peripherals, appliances—will be based on several key design elements of the SV-318. What does this mean to you, the consumer? A great deal, because when you buy an SV-318, you will not only be able to use all of Spectravideo's own software and hardware—you'll also be able to take advantage of all the remarkable new equipment that will be coming from other MSX participants.

In addition, the software aspect of MSX was largely inspired by the software built into the SV-318. From the outset, Spectravideo offered built-in Microsoft BASIC as its resident interpreter. Now, Microsoft also makes a LOGO program compatible with the SV-318. It was Spectravideo's Microsoft BASIC/LOGO that helped to make MSX possible.

Another standard that Spectravideo can take credit for is the built-in Joystick/Cursor Control. Built right into the SV console, this control is always at fingertips and is much easier and faster to use than external joysticks or conventional editing controls.

Certain engineering elements that helped to make this built-in control possible have also been incorporated into MSX.

OTHER STANDARDS OF EXCELLENCE.

While these are the computer standardizations that Spectravideo helped to initiate, they by no means represent the whole SV-318 story. This remarkable computer has also established many standards of excellence that other personal computers now aspire to:

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- **More Available Software**—Built-in CP/M compatibility gives you immediate access to over 3000 existing software programs. Plus, you can utilize Spectravideo's own fine software library.
- **Advanced Graphics Capabilities**—The SV-318 offers 16 colors in high resolution, and more importantly, 32 programmable sprites that allow tremendous control of movable screen objects.
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A BEGINNER'S GUIDE TO PROGRAM CONVERSION

program as a source of ideas and techniques, but don't be limited by it.

Let's say you've decided on a conversion. I'll identify the sections likely to cause problems. PEEKs and POKEs are an obvious place to start. The author should have added REMark statements telling you what they do, and you need only figure out how to achieve the same effect on your own machine. If not, then you're into the business of getting hold of the host machine (that is, the machine the program was written for) and trying out anything you're not sure of.

Next to look for is the screen displays: mainly graphics and PRINT AT statements. These will probably have to be completely rewritten. Work out what is happening — what is being plotted and where messages appear on the screen. This can sometimes be tricky, particularly where those quaint Commodore control-codes are concerned (you may have gathered that I

don't jump up and down about Commodore screen-handling). Bear in mind that you don't have to duplicate the original screen exactly — or even approximately — for menus and so on. Generally, the only time when you need to recreate the screen faithfully is during games where the graphics are vital. The difficulty of adapting such programs has already been mentioned.

By now, you will probably have come across several sections of code that appear totally alien to the version of Basic supported by your machine. In these cases you must work out exactly what is happening, when, where, why and how. Once you've done that (he says lightly), it should be a straightforward matter to replace the offending code with your own routine. This is when you find out just how structured the program really is. I once followed a series of about nine GOTOs, the final one ending on the line following the first one with nothing

having happened in between. OK it's an extreme example, but there are some funny people about . . .

Anyway, next on the agenda is to go through the listing making note of anything which looks slightly, rather than totally, out of place in your machine's Basic. You'll find that most of the changes will be fairly obvious even if you've never seen some of the keywords before. Most people would guess that HOME is the same as CLS, for example. Next month, APC will publish its Basic Converter Chart (which has been no mean feat to produce) which should help you sort out the stranger idiosyncracies of some machines.

If you're converting to a less powerful Basic then you may have to work at simulating some of the more sophisticated features. FOR-NEXT loops come in very handy to simulate functions such as INSTR\$, STRING\$ and so on.

And this is the point where you start hammering away at the keyboard! Provided you've done all the above thoroughly, a combination of the APC Basic Converter Chart and good old-fashioned trial-and-error should see you through!

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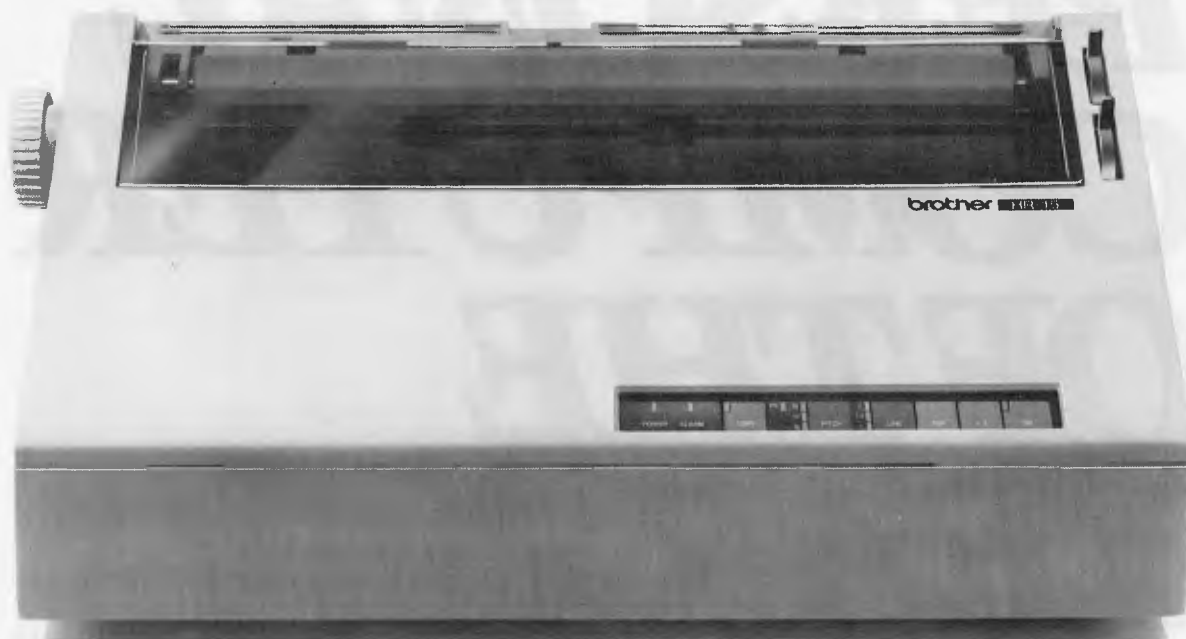
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T/Maker: multifunction management on the IBM PC

T/Maker III is not an earth-shattering spreadsheet or mind-blowing word processor, but John King finds it's a good all-rounder.

T/Maker III doesn't make the tea for two. It is a word processing, data processing and file management single program package aimed at the beginner and the seasoned user.

It is made by the T/Maker Company in Virginia, and is marketed by Lifeboat Associates. There are other products coming through soon, and it will be interesting to see if the company comes up with a Visiclone spreadsheet.

The set-up used here was an IBM PC—two disk drives are essential, with a minimum of 300k. There are a few idiosyncracies in this variant, but they are quite well covered by the bright yellow addendum sheet.

Features

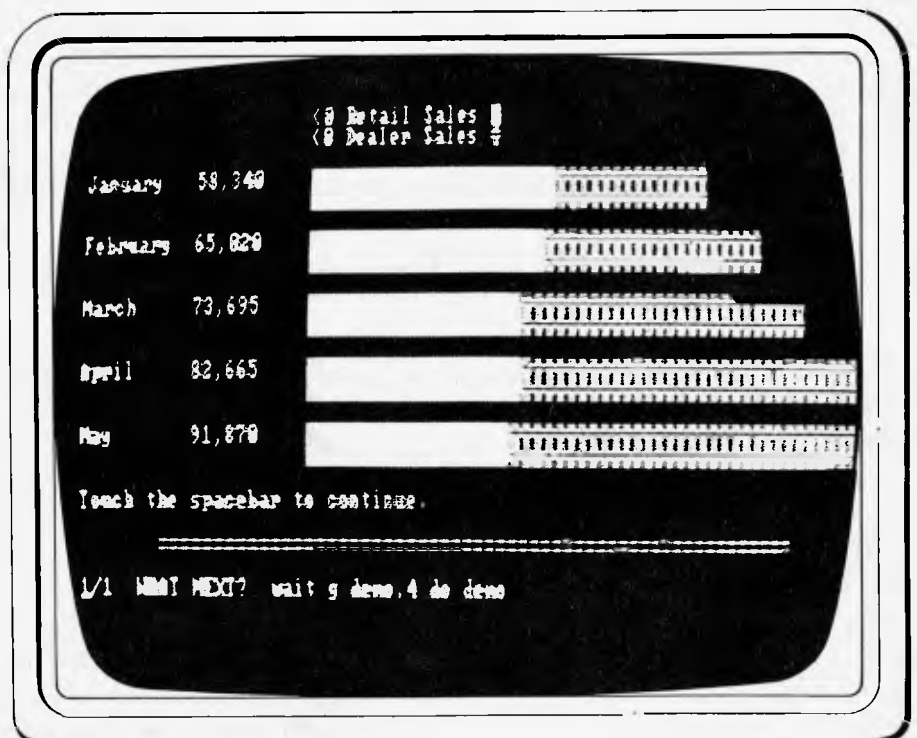
As stated the T/Maker has a variety of uses: the manual splits into six main sections. It begins with word processing then moves on to the electronic spreadsheet, list processing, graphs, data transfer and general file management. The middle four are the group referred to elsewhere in the manual as 'data processing'.

The power and flexibility regularly pushed by the blurb are attained by the availability of using all these options on the same bundle of data at, to all intents and purposes, the same time.

The intro to the manual says that these six types of use are really only variations in suitably sticking together some of the 36 or so key command words. Sadly there is no quick reference guide to what these mere three dozen keywords are, but it's easy to track them down through the manual (and you can learn quite a bit at the same time).

A more detailed look at these seems to show some gaps, but these are later filled by other commands.

The following commands are



explained in detail in each relevant part of the manual.

WP: EDIT ALIGN PRINT
Spreadsheet: COMPUTE CLEAN COMBINE

List: ARRANGE FIND REPLACE
DROP KEEP MATCH SORT TALLY
Graph: BAR

Data Transfer: LOAD UNLOAD
File Management: CLIP CREATE DATA

DELETE DO FILES GET INFO
Others: INSERT LIST MERGE
NOTABS RENAME RESET SAVE
STOP TABS WAIT (GOTO)

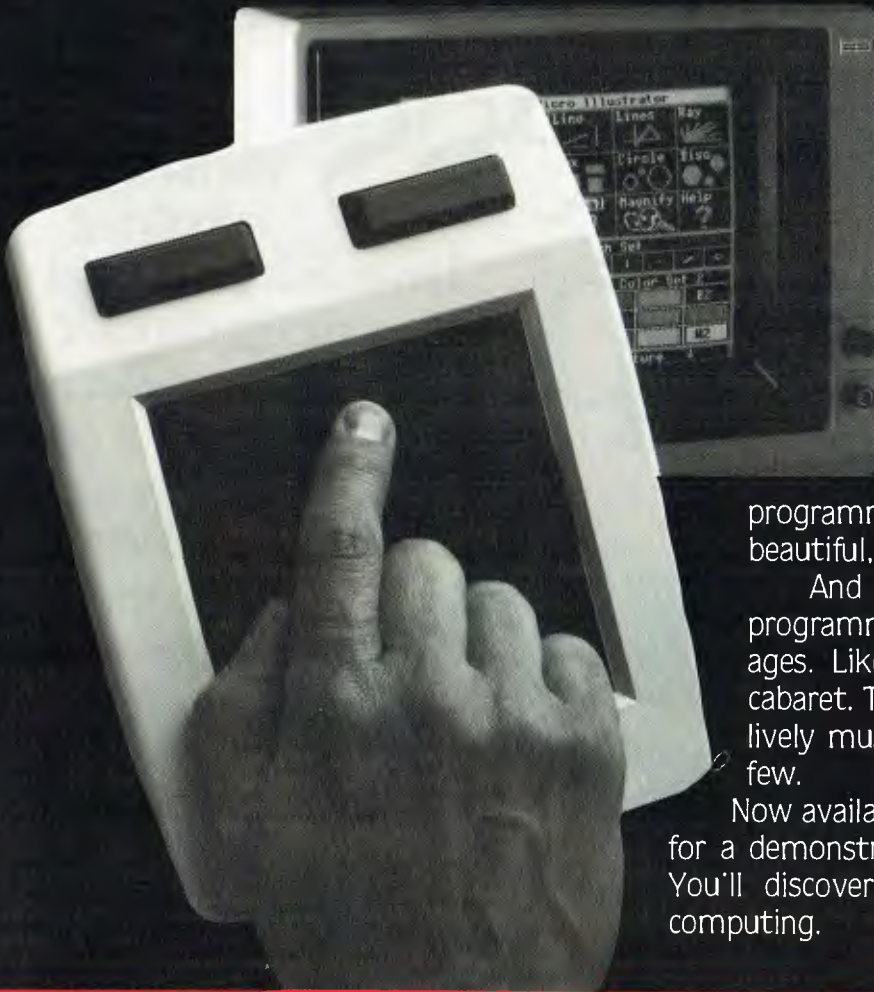
Almost any spreadsheet or word-processor routine will use many of the file management and data transfer codes. There is no limit on mixing these keywords.

Presentation

The packet came from Lifeboat in a big cardboard box which eventually revealed two diskettes, one big manual and one heavy card quick reference booklet. Both these were in glossy black with a series of spectrum stripes across the cover. On the latter, the page tags and the colour patches went by the same order on each page — rather a neat trick. One petty point: if this had a backrest to lean on while getting to know the package it would score an extra bonus mark.

The software for the IBM comes as two diskettes, one for immediate use and a second with demo files and a customisation program. Unlike Lotus 123 and several other programs of this

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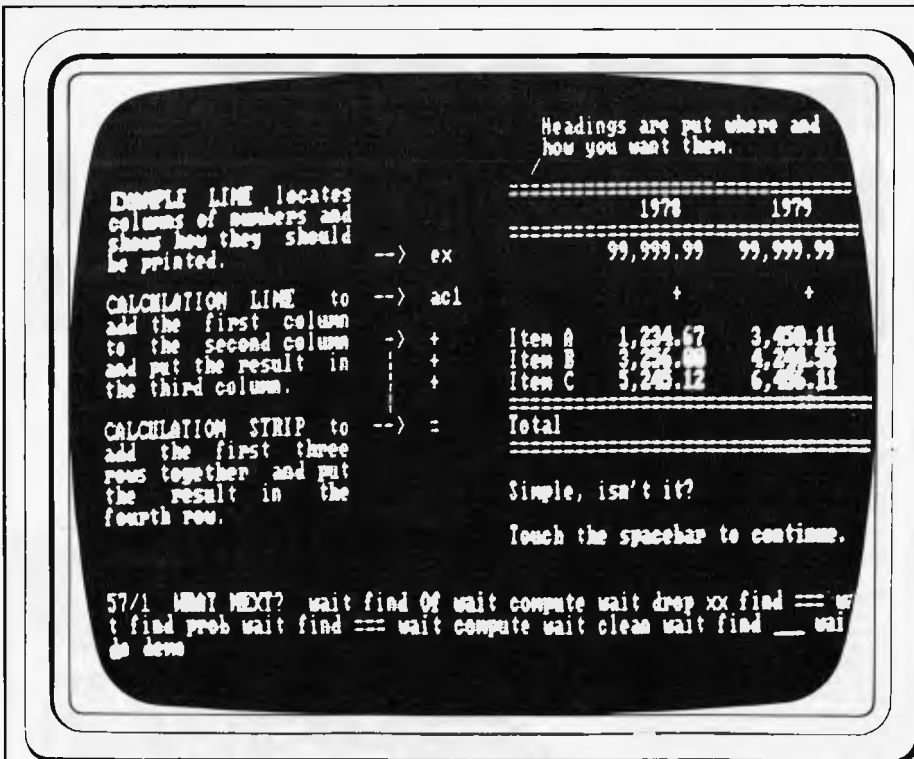
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(both tedious and kitsch).

The Electronic Spreadsheet is a different beast altogether. A major point is that it needs a very different type of analysis of the available input and of the desired output to get the required result than is used on a Visiclone. The structure used here is NOT the 'text/value/formula related cell' common to so many others.

The method used here is based on simple mathematical chains written, like ordinary sums, either horizontally or vertically. This is not to say that the version here is at all difficult to use, merely that you have to think rather more than the manual might imply. It is, however, not so easy to make changes to a file as might be thought likely on a 1982 generation number-cruncher.

The list processing facility contains several features that are new to me — particularly the command MATCH. This is a great help in producing exception reports etc. There is one apparent weakness in that the sort is assumed to apply to the whole of the specified column or columns as opposed to a selected block within such a set of data.

The graphics section is quite limited in comparison with other graphics extensions to spreadsheet packages. This one only allows a variety of bar charts. However the depth and

The Printer's Prompt

The Print command brings the "Printer's Prompt" to the screen.

NEXT PAGE 1 (YES.SCREEN.NO.GO. QUIT)?

One of the following answers should be given:

Answer	Result
Y	Prints the page on paper.
S	Prints the page on the screen. The printing may be stopped temporarily (and re-started) by touching the spacebar.
N	Skips the page. The Printer's Prompt appears for the next page.
G	Pre-answers all following Printer's Prompts with y.
Q	Terminates printing session.

Design Commands

Design Commands carry out a number of editing functions. They are inscribed into the file but are not printed.

Design Commands always begin with a period in position one. Keywords in Design Command (e.g., single) may be abbreviated to their first three letters (sin).

A sample of the documentation.

class, it is possible to copy the system disk.

Getting started

This is quite straightforward, although there was the problem in getting a back up copy of the system disk. Once aboard the tea-trolley, the training course and the demonstration showed the basic habits necessary for using the main parts of the system.

The manual contained, among its nearly 300 pages, a back-up chat show on the tutorial. This could have been aimed a little higher, but is presumably targeted at the first-timer with some brains rather than at the hardened user/reviewer.

The manual is helpful, but there are both underlaps and overlaps between it and the 14-page quick reference booklet. I often find an even smaller A4 folded card cribsheet is useful but there is none in the package.

The demo is easy to get at but the first screen is a perturbing sight. The bottom three lines begin with:

1/1 WHAT NEXT? wait find III wait 56/22 wait /1 clean etc etc

This apparent nonsense occurs on every screen. During the first few pages you go from panic to irritation to ignore — not the best way to begin.

There are also typographical errors in the demo, and there is no excuse for these in a professionally prepared package.

The demo also has an irritating habit of hiccuping—ie scrolling a page or two or even three times before holding. There is presumably a reason — perhaps

something to do with embedded command words.

Lastly the demo doesn't tell you on the screen how to exit, let alone how to get at the main system program. The manual seems to want you to go all the way back to the PCDOS prompt A> (which it refers to throughout as A:). It may be that they want to give you a break while you make the T — but it's very tiresome the first couple of times until you have worked past it.

In use

The word processor was the first piece to be checked out. This is not, like more and more of this type, a menu-driven operation. But it is easy to use. This review was all written on T/Maker with no great difficulty. One minus point is the lack of a word count.

The screen formats are reasonable and can be called up at any time. Whether or not they are adequate for everyone is always a matter of opinion; but they could certainly be improved. For instance, it is always useful to have some idea of the number of lines or words done so far without going through a sequence of button-beltting.

Similarly I find, admittedly after prolonged exposure to menu driven programs, that this is not so quick to use. One of the more wearying points of this T/Maker III is the need to write so many of the commands out in full.

The method for putting in comment lines is to preface them with the characters . . . Hi Jack or at least . . . Hi

complexity of most data can become radically easier to understand when limited by such a constraint — that is to say management find it quicker to look at a well designed picture than at 27 pages of printout.

Verdict

For an office-user there are a number of concepts which appear at first glance to be very specialised, rather far from ordinary day-to-day needs and probably of doubtful value. Actually it isn't that bad. T/Maker can do a lot of number-crunching and data manipulation without a disproportionate effort on the part of the user.

The word processor is pretty good, in fact it is so easy to learn that it is the best part of the package. It almost, but not quite, merits full marks for value. In comparison with other WEP programs it does have some limitations but these are not that drastic for humdrum clevertyping. The list processor is a useful and worthwhile facility.

Spreadsheet is much more a matter of getting used to it. The graph is, within its stated limits, quite useful. The underlying file management and data transfer routines are by implication perfectly satisfactory.

It will be interesting to see whether the manufacturer comes out with an improved version (which should be well worth getting) or whether the next step is a series of related programs.

In the latter case they will be improving the tea-set without improving the tea!

Prices

T/Maker sells for around \$405 including sales tax and is available from Lifeboat Associates dealers. Other versions of T/Maker III are available for CP/M80, CP/M-86 and MS-DOS.

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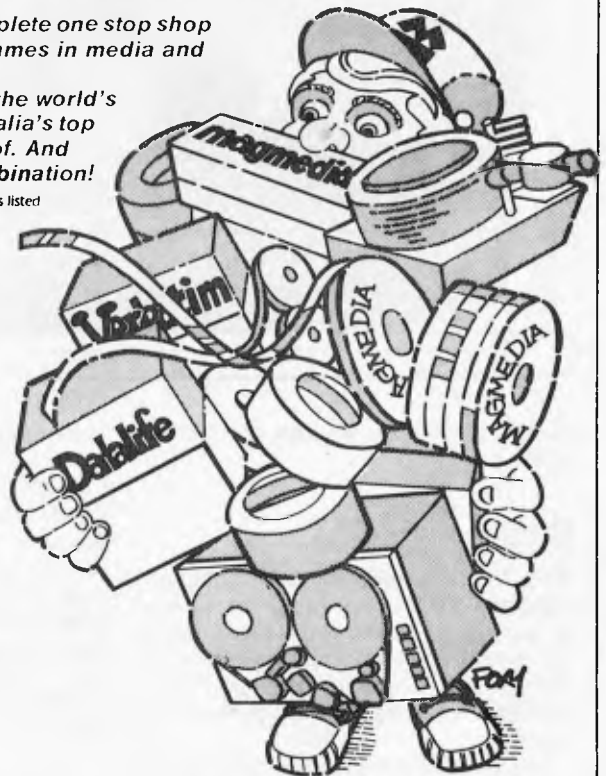
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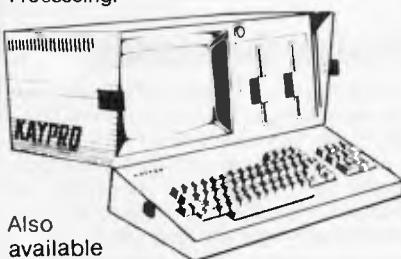
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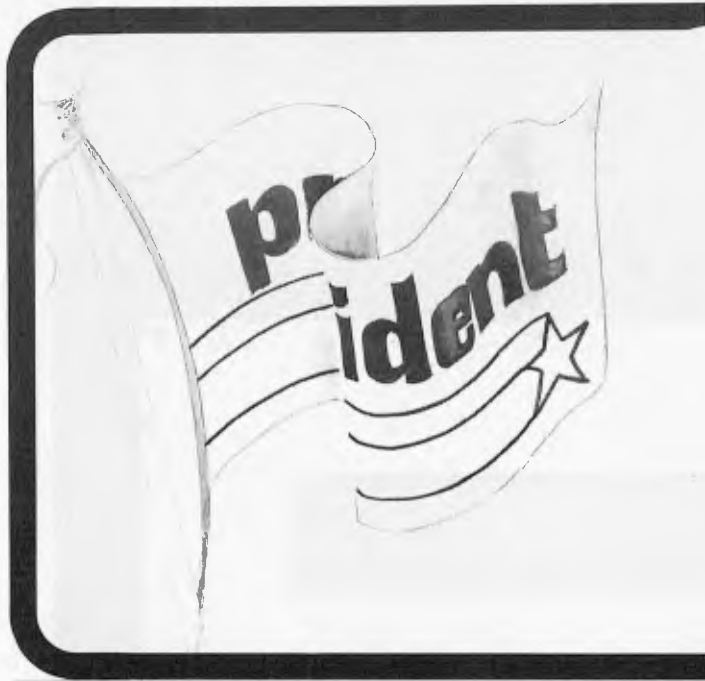


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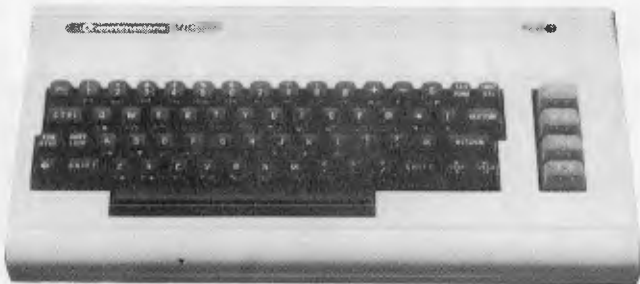
HOME COMPUTER SURVEY



HOME COMPUTER SURVEY

APC's round-up of home computers is intended to help readers who are thinking of giving (or receiving!) a micro for Christmas. The criterion used to select machines was price: all the computers included retail for under \$1000. It should be realised that the systems reviewed were not subjected to a full APC Benchtest — some of them have already been Benchtested, and readers will be referred to previous issues of APC where appropriate. Instead, the object was to compare the systems over a period of a few weeks, concentrating on the features that matter for home use. To ease comparison we developed a points system to summarise our findings under five headings. 'Ease of use' refers to how simple it is to set up the computer and to the quality of the keyboard and display — "mechanical" factors, if you will. 'Ease of programming' indicates the degree to which the hardware features (e.g. graphics) are supported by the programming language used by the system. A word of warning: a very simple machine is likely to score highly as it has few features to support! 'Expansion and accessories' covers the range of items offered by the manufacturer or other suppliers, including software. 'Documentation' naturally describes the quality of the manuals and other printed matter included with the system. The final category 'Presentation', is included mainly for the benefit of those who like the gifts they buy to look like they cost as much as they did, but the score is also affected by the completeness of the package. For example, a system that requires the separate purchase of a modulator before it can be used with a TV would be penalised in this area. Scoring in all categories is on a scale from 1 to 5, but please don't use the scores without reading the text, and remember that the scores are relative rather than absolute and that no allowance has been made for price, mainly because prices could well change before the pre-Christmas period. These are critical reviews of home micros so if there seems to be an emphasis on faults and failings of the machines it's not an absolute reflection on the entertainment and fun you can expect to get from your micro. We've attempted to provide a fair appraisal of each machine paying attention particularly to their shortcomings, as there's plenty of info already around about their features!

VIC 20



The VIC 20 is probably the most aggressively marketed home computer in the country, with advertisements appearing on TV and radio as well as in the general and specialist press. It's sold through department and bulk stores in addition to Commodore's traditional outlets, and cut prices and package deals can often be found.

Setting up presents no problems, as the instructions are clear and it is impossible to put a plug into the wrong socket as several different types of connector are used. The separate power supply and modulator do not help to keep things tidy, and add to the number of connections that must be made. The various leads were generally long enough, although I have heard that many VIC users find it necessary to fit an

extension lead between the modulator and their TV.

The size of this type of computer is largely determined by the keyboard, and Commodore have sensibly adopted a full size design. The feel is acceptable, and bears comparison with keyboards fitted to more expensive computers.

The quality of the display was quite good, although a 'herringbone' was noticeable when lighter background colours were used. I never really understood why the VIC only has a 22 column display. I suppose longer lines would eat up more memory, but surely a little more RAM would not make a significant difference to the price. High resolution graphics (nominally 176 x 184) are possible on an unexpanded VIC, but only on a portion of the screen. To use the whole screen, extra memory must be fitted, if the Super Expander cartridge is fitted it provides sufficient RAM as well as extending Basic to support graphics and other hardware features that must otherwise be controlled by PEEKs and POKEs.

Sound information may be added to the TV signal as there are three tone generators (having a combined range of five octaves) and a white noise generator for sound effects. They share a single volume control, which is adjusted by POKeing rather than by turning a knob.

I have already mentioned cartridges in the context of the

Super Expander, but there is also a variety of other programming aids and games from Commodore and other manufacturers. While cartridges are quick and easy to use (no waiting for a long program to load from tape), paying \$40 or \$50 for a game seems a little risky when you might become bored with it after a couple of hours. Of course, this applies equally to other machines using cartridges.

Several accessories are listed in the Commodore price list. As well as the cassette recorder, disk drive and printer, there are 3k, 8k, and 16k memory expansions, an RS-232 adaptor, game paddles, and a joystick. I wasn't particularly impressed by the Commodore joystick, but compatibility with the Atari means that the 'improved' joysticks from other manufacturers (e.g. the Quick Shot) can be used instead. A light pen interface is part of the VIC's standard equipment, but the pen itself is not available from Commodore.

The VIC user manual is essentially a tutorial plus extensive appendices containing reference material (e.g. character sets, connector pin assignments). The visual style is reminiscent of Donald Alcock's "Illustrating Basic", but the text is more folksy. Overall, it is non-threatening, but without being too cute. People intending to write their own programs will almost certainly want the Programmer's Reference Guide (sold separately), as this contains the information needed to make use of the VIC's graphics and RS-232 port, as well as giving a circuit diagram and a memory map. Those interested

in machine coding will appreciate the introduction to programming the 6502 and other chips as used in the VIC, as well as the description of the Kernal subroutines (low-level routines that carry out functions like printing a character, reading the keyboard, etc).

The main weakness of the VIC is its 22 column display. Since the cost of a VIC with extra memory approaches that of a Commodore 64, it could be worth considering the latter and getting the benefit of a 40 column display, but I think that anyone looking for a relatively cheap games oriented computer with a good range of accessories would be happy with a VIC.

Processor	6502
RAM	5k (Approx. 3.5k user RAM)
ROM	20k

Ease of use	★ ★ ★
Ease of programming	★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★ ★
Presentation	★ ★ ★ ★

Benchtested Vol 2, No 4 (November 1981)

Review machine supplied by Micro Country, Hawthorn, Vic.

MICROBEE



The MicroBee is one of the few microcomputers designed and built in Australia. It is a compact unit with an impressive specification at a moderate price.

Unlike most home computers, the MicroBee is intended for use with a monitor or modified television, and therefore does not produce an RF signal. This may be seen as a disadvantage by some, but is necessary if more than 40 characters are to be displayed per line. The monitor included with the test system gave good results with both screen formats (64 x 16 and 80 x 24). The MicroBee is supposed to be capable of generating 32 colors, but as the monitor was only monochrome, it was not possible to explore this feature. Brief instructions for modifying a TV are part of the documentation.

The MicroBee also has a graphics capability, but this will be described in the context of the Basic interpreter.

The keyboard is full sized, and very easy on the fingers. My only objection is that it is somewhat noisy. Although it cannot be described as slimline, the keyboard is thinner than some others, making it less tiring for prolonged use.

A single ribbon cable is used to make the standard

connections to the MicroBee (power, video and cassette I/O). Some users are likely to unzip the cable into three separate leads in order to make it easier to position the various components. Parallel and serial ports are also provided.

The MicroBee's Basic was specially written and has a number of unusual features. The conventions used for variable names are particularly strange: integer variables are denoted by single letters (A-Z), reals by a letter followed by a digit (i.e. A0-Z9). Integer and real variables cannot be used in the same expression unless the type conversion functions are used (FLT gives the real equivalent of an integer, and INT converts a real to an integer). String variables are like reals with the addition of a dollar sign (A0\$-Z9\$), and substrings are accessed by specifying the first and last characters positions of interest — e.g. the third, fourth, and fifth characters in the string B3\$ (;3,5).

A simple line editor is included, along with a global search and replace function. The manual suggests that the latter is particularly useful when converting a program from a different dialect of Basic. Automatic line numbering and renumbering are also useful when typing in programs.

Input and output may be redirected from the keyboard and screen to the other I/O devices (although not all combinations are permitted). This can be used to store data on tape, or to send 'printer' output to the screen to save paper while a program is being debugged.

There are several other unusual commands. UNDERLINE causes all output to be underlined (naturally), while CURS and SPEED respectively control the position of the cursor and the rate at which it flashes. ZONE sets the spacing generated by a comma in a PRINT statement, while SD gives control over the number of significant digits used to represent the value of a real expression when it is printed.

Two types of graphics are supported by Basic. Low

resolution (128 x 48) is derived from special characters which give the permutations of quarter-space blocks. High resolution (512 x 256) is achieved by the use of a programmable character generator, which means that not all combinations of pixels can be displayed on the screen, although some very complex diagrams can be produced. The graphics commands are SET (turn a pixel on), RESET (turn it off), INVERT, and PLOT (for drawing lines). It is also possible to POKE values into the programmable character generator to redefine the appearance of any character, a technique that is illustrated by some of the programs on the demonstration tape.

A mechanism is provided to simplify the passing of 'parameters' to subroutines. If the subroutine starts with a VAR statement giving a list of variable names, then a list of values can be included in the GOSUB statement and they will be assigned to the variables. For example instead of

```
10 X=10
20 Y=30
30 GOSUB 100
40 END
100 PRINT X*Y
110 RETURN
```

the MicroBee allows

```
10 GOSUB [10, 30] 100
20 END
100 VAR (X,Y)
110 PRINT X*Y
120 RETURN
```

which has precisely the same effect, but can make programs easier to read. Unlike 'true' subroutine parameters, variables used in this way are (like all Basic variables) global rather than local.

Another item that helps readability is the option of using an ELSE clause in an IF statement.

The MicroBee is also fitted with WordBee, a ROM-based word processing program. Although I did not have time to explore all its features, it seems to have most of the really useful facilities generally found in word processing programs. It doesn't claim to be a full professional system, but it is a very useful addition to a small computer.

A "network ROM" is also offered, providing ADM3A terminal emulation plus the ability to transfer files using the Christensen protocol (initially developed for use with CP/M systems, but now adopted by the users of a variety of computers).

The review system's ROMs also contained a machine-code monitor program, once again containing the most useful commands (modify memory, load, save, run, etc) but without the frills.

The documentation for the MicroBee is not too bad, but the company is aware of the shortcomings and plans to have it rewritten by someone with good writing skills as well as a knowledge of the system. The Basic manual is fine providing you already know how to program. It is definitely not a tutorial, but the descriptions of the various features are very clear. A set of Technical Notes describes the changes made to Basic and WordBee for the IC model and gives information about the network ROM. I found the WordBee manual rather difficult to read, but I got the feeling that it probably contains most of the necessary information. The quick-reference sheets at the back came in useful while I was experimenting.

The MicroBee seemed quite a nice machine, but as a home computer it has the disadvantage of not being able to plug straight into a TV. I suspect that many people end up buying a second set or a monitor for use with their micro, but the MicroBee requires that extra expense (or modifications to the family set) at the outset.

Processor	Z80
RAM	32k (29½k user)
ROM	26k (as tested)

Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★
Documentation	★ ★
Presentation	★ ★ ★ ★

An earlier version was benchtested in Vol 3, No 4 (April 1982), reprinted in the Benchtest Special.

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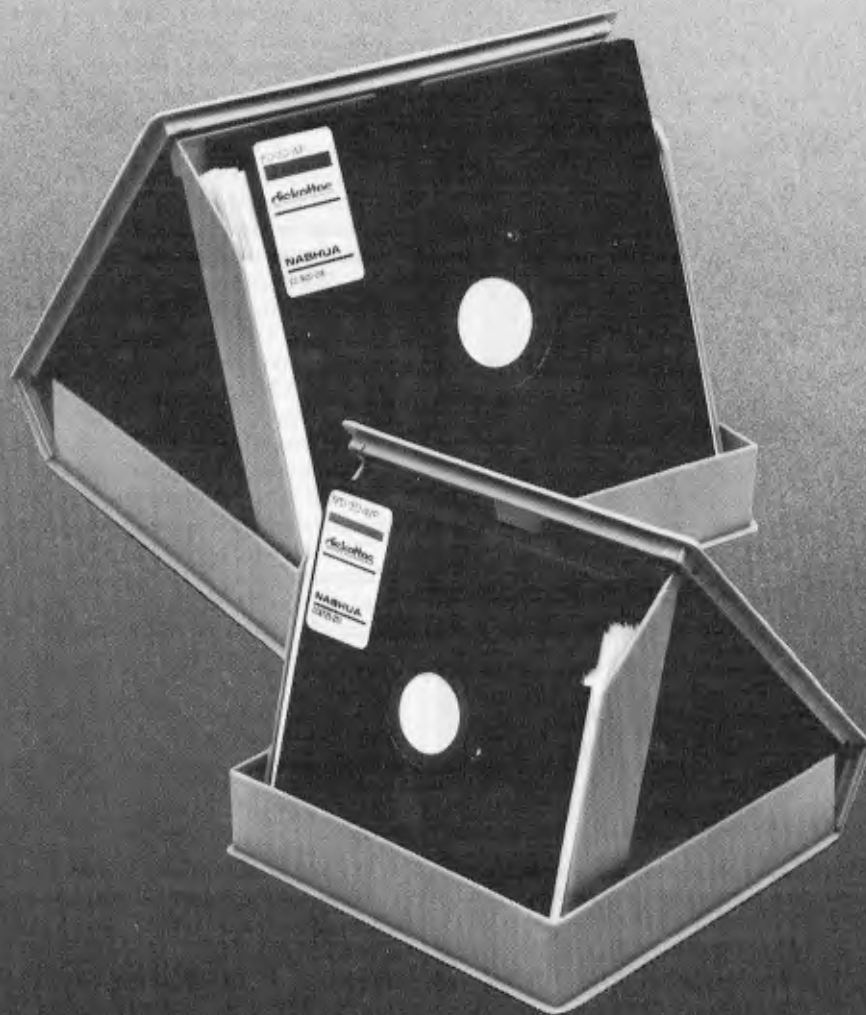
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TRS-80 MC-10 MICRO COLOUR COMPUTER



The MC-10 is an unusually small machine, measuring just 2" x 8½" x 7". It has much in common with the Color Computer, like a 16 line, 32 column display (black on green with lower case represented by inverse video), but it only has low resolution (64 x 32) graphics. Nine colors are available for graphics work, but within each character position each of the quarter-squares that are turned on must be the same color, while the remainder are black.

Although the keyboard uses small calculator-style keys, they are made from a rigid plastic and I found them much more positive than those on certain other machines. Most of the keys can be used in conjunction with the control key to enter a Basic keyword at one stroke, and are labelled appropriately. The distribution of the keywords seemed strange, with no attempt to make use of mnemonics like P for PRINT, S for STOP, etc. Control-0 acts as a shift lock.

Other hardware features are a cassette interface and a simplified RS-232 serial port, (the firmware uses it as a 600 baud printer port, but there is a suggestion that terminal emulation software could appear). There is also an expansion connector, primarily for a 16k RAM pack — it looks just like a Sinclair! The TV modulator is built into the case, although the power supply is packaged separately.

The Basic is very similar to that used in the Color Computer (most programs should work without alteration), and is therefore a fairly ordinary Microsoft stand-alone Basic. The only features worth special mention are those that control the graphics and sound: SET and RESET turn pixels on and off, while POINT can be used to determine the state of a pixel. SOUND produces a note of specified tone and duration.

The manual (as I have come to expect from Tandy) is easy to read and is basically a tutorial for those with little or no programming experience, plus a reference section at the back. The manual seems to cover all the standard features, and there is also a quick reference card.

That's about all there is to say about the MC-10. It's pleasant enough to play around with, but it does seem rather limited — no high resolution graphics, no game controllers, restricted display format. I suppose Tandy decided they needed a low-end machine to compete with computers like the VIC, VZ200 and Sinclair.

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Processor	6803
RAM	4k (approx. 3k user RAM)
ROM	No information

Ease of use	★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★
Documentation	★ ★ ★ ★
Presentation	★ ★ ★

Review machine supplied by Tandy Electronics.

TEXAS INSTRUMENTS TI99/4A



My first reaction on setting up the '4A was to wonder why there aren't more of them around. The cartridges I received for the review were the more expensive ones (\$50-\$60), although Texas Instruments assure me the average price is between \$30 and \$50. Certainly a weight off my mind.

The display generated by the '4A is *excellent*, the best I've seen on a TV screen, and better than some that use monitors. Admittedly, the set is not being driven hard by the 24 line, 32 column format (only 28 columns are available to the Basic programmer), but the 15 colors are bright and the picture is steady. The modulator provides a signal on UHF channel 36 (I had the same plug-incompatible problem as I did with the

COMX), but I believe a VHF modulator is also available if you need one. Although the modulator is a separate unit it was not inconvenient as the lead from the computer was quite long, with a short cable going on to the TV. For some reason the modulator is in a much bigger case than other manufacturers use.

The power supply is also large and separate. It's about the size of a smallish car battery charger, but once again the generous leads offset the inconvenience of an extra box.

I found two faults with the keyboard. The enter (i.e. Return) key is the same size as an ordinary one, and is next to the shift key, which is (as usual) double-sized — as a result I kept pressing shift instead of enter, and then wondered why nothing had happened. The other, more serious problem is that there aren't enough keys. Symbols like " and the cursor controls are accessed by holding down the FNCT key, while pressing another key. Although these extra functions are shown in grey on the front of the keys, it is not a very convenient arrangement. The top row of keys (the numbers) are used as function keys in conjunction with the FNCT key, and provision is made for label strips to be fitted above the keyboard. A pre-printed strip is supplied showing the standard functions, and there are also several blanks for your

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own purposes. Some of these keys provide an editing function (essentially insert or delete characters) which is ok, but not as good as the VIC's screen editor, as it is necessary to 'call up' the line of interest.

An unusual feature is the presence of two cassette interfaces, but I doubt that this would benefit many users — most buyers would either manage with one recorder or they would need disks.

The built-in Basic is pretty good, supporting the graphics, sound, joysticks, and files (disk or tape). It also provides auto line numbering as well as resequencing. Extended Basic comes in the form of an optional cartridge which I strongly recommend, if only for two of its features: sprites and subprograms. Unlike the "sprites" on another computer in this article, those on the '4A are the real thing as they continue to move once started on their way. In practice, you put a sprite in an appropriate place and specify its speed in the vertical and horizontal directions; it is also possible to change the speed and size of a sprite. Sprites make programming moving graphics so easy I wonder if it's worth buying "shoot-em-up" games. As far as I could tell, the only way of using non-sprite graphics directly from Basic is to define appropriate characters, although I have seen a machine-code routine for point and line plotting.

Subprograms are like subroutines that can take parameters and have local variables. Once again, this makes programming much easier. It would also make it much easier to maintain a library of routines, as it avoids the problem of worrying about variable names. Extended Basic has many other features including improved screen handling, error trapping, and support for the optional speech synthesiser.

I mentioned cartridges in the opening paragraph. TI have come up with a convenient feature that means that you don't have to turn off the power to change cartridges. Plugging in a cartridge automatically resets the machine to the power-on state, then after pressing any key (the original screen includes color bars and text, which is very useful for adjusting the TV), a menu appears, giving the choice of either TI Basic, or whatever is in the cartridge. The cartridge program is identified by name, a nice touch which might be helpful if the label ever came off . . .

The manuals are very good. Both a beginner's guide and a reference manual are provided, along with a quick reference card. For some reason the reference manual is not arranged in alphabetical order, but there is an index. The documentation might not be perfect, but if other manufacturers followed suit there would be less need for books like "Getting Started With Your Super-Wizzo Mark I".

Various accessories are listed by TI, including "wired remote controllers" (joysticks to you or me) and a speech synthesiser, both of which connect directly to the main unit. I got the impression that the other items like disk drives and extra memory require the use of an expansion unit which could be a significant expense.

There is a fair range of software from TI and independent companies, with the emphasis on games and educational programs for children. The machine itself costs \$499, which seems reasonable, but look at the total system cost before you buy. Just in case such things matter to you, the '4A is the only computer in this review that is based on a 16-bit processor; but don't buy it just to impress the neighbours — buy it to write your own video games and put some creativity into your life.

Processor	9900
RAM	16k (approx 13½ usable)
ROM	26k

Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★ ★ ★
Presentation	★ ★ ★ ★ ★

Benchtested in Benchtest Special.

Review machine supplied by Gametronics, South Yarra, Vic.

COMMODORE 64



When this set of reviews was being planned, I wondered if the 64 were really anything more than a grown-up VIC. I think that description is a fair one, as although the 64 has a number of good features it does not have that extra something that makes it stand out from the crowd.

Like the VIC, the 64 makes use of a variety of plugs and sockets to avoid incorrect connections, and the leads seemed longer than the VIC's. An RF modulator (UHF, nominally

channel 36) is built into the main case, and a separate socket is provided for connecting a video monitor and/or an audio amplifier. One pin on this socket is described in the manual as an audio *input*, but there is no indication of how it can be used. There are also two joystick/paddle connectors (one with a light pen input), a cassette interface, cartridge socket, serial I/O port (for disks, printers, etc), and a parallel 'user port'.

The text display has the familiar Commodore format of 40 columns and 25 lines in 16 colors. Some of the publicity material refers to 320 x 200 pixel graphics, but the manual offers no explanation of how this feature may be used except by defining sprites. I have heard that it is possible to POKE appropriate values into the display RAM to get a hi-res background for the sprites, but I don't know how true this is.

The sprites do not move themselves; it is up to the program to continually update the positions. That's a shame, as it would not have taken much to build a "velocity" feature into the software. I think anyone with a little machine-code experience should be able to add automatic motion to the behaviour of the sprites without too much trouble. What

the hardware/software does do for you is handle the sprite priorities (so that one object can pass behind or in front of another), detect collisions (possibly generating a processor interrupt request, but this is of little use to the Basic programmer compared with the powerful interrupt features of the Spectravideo), and doubling the size of a sprite in either of both dimensions. It appears that multicolor sprites (up to three colors) are possible, but once again no information is provided. What you are told is how to POKE a sprite into existence (as each is 21 x 24 pixels that is a tedious process). There is an eight sprite limit, by the way.

This shows the basic problem with the manual: it drops all sorts of hints about some of the sophisticated features of the 64 (it even gives pin assignments for the various connectors and a partial memory map), but doesn't tell you how to use them. It contains more information than a non-programmer needs, but frustrates the experienced user with references to the Programmer's Reference Manual. I suppose it is OK, but I preferred the VIC manual.

The Basic is Commodore's Version 2, as found in the VIC and some CBM models, which means all the goodies like sprites and music must be controlled by PEEKs and POKEs. "Simon's Basic" is an \$80.00 cartridge which is supposed to add the commands that virtually all programmers will want.

The 64 can drive most of the Commodore peripherals (cassette, disk, printers, etc) and it has been launched with a respectable range of software. For business use there is the 'Easy' range, offering word processing, spreadsheet, stock control, financial planning, etc), while there are a number of games for home use, as well as extra programming languages (Logo and PILOT). Avid games players might like to investigate the Discwasher Pointmaster joystick — about \$30, it was the most comfortable I have ever used.

In some ways I was a little disappointed with the 64 — perhaps I expected too much from it. I have a feeling that if Simon's Basic had come with the test machine I would be writing in glowing terms. If you're reading this Santa, a Commodore 64 with a disk drive and Simon's Basic (and maybe the new color monitor) would be very acceptable.

(See 'Simon's Basic' tested elsewhere in this issue. — Ed.)

Processor	6510
RAM	64k (38k usable)
ROM	20k



The VZ200 is fairly typical of the micros at the bottom end of the price range. It has the now familiar rubber keyboard,

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Documentation	★ ★
Presentation	★ ★ ★ ★

Benchtested Vol 4, No 5 (May 1983)

Review machine supplied by Micro Country, Hawthorn, Vic.

VZ200

although this one seemed a little more positive than some others I have used. Most keys have four functions: the normal mode gives upper-case and digits, holding down the shift key usually results in a graphic character, while the control key adds single key entry of Basic keywords and screen editing facilities (cursor movement, insert and delete). Simultaneous use of the control and return keys while pressing an ordinary key generates function names and the remaining keywords.

The display is not particularly impressive. The picture quality is fine, but there are only 16 lines of 32 characters. In this mode the 'quarter-square' graphics characters give a resolution of 64 x 32, but there is also a graphics mode giving 128 x 64. This makes the VZ200's graphics look limited

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when compared with those produced by other systems. The choice of colors is similarly restrictive, with two sets of just four colors for graphics; this does improve to eight colors plus black in character mode.

Other points worth mentioning are the provision of separate TV and video outputs, and the generous lead on the plug-pack power supply unit.

The Basic lacks the sophisticated features of the extended Basic found in the Spectravideo and Tandy Color computers. However, it does include primitive graphics commands (SET, RESET and POINT), as well as a SOUND command which generates a tone with a specified frequency and duration. Another feature that is not always found on cheaper machines is a data file facility (using PRINT# and INPUT#). On the subject of files, I found the VZ200's cassette interface to be much more sensitive to volume levels than other micros that I tested. Once I had found the right setting, things went smoothly.

The documentation was another run-of-the-mill affair. The so-called Basic Reference Manual is actually a tutorial, although there is some reference material at the back. An eight page User Manual shows how to set up the system, plus a troubleshooting guide. The final part of the package contains listings of 21 simple programs, a few of which might be useful. Even though they appear to be reproductions of actual listings, there is at least one syntax error present. Another snag is that the copyright notice states "No part of this book may be utilised in any form . . . without permission in writing from the Publisher", and nowhere does the publisher state that the programs can be used by a VZ200 owner!

The VZ200 was supplied with a 16k RAM pack which was surprisingly bulky. I found it necessary to keep the TV lead away from the RAM pack to avoid interference. The RAM pack comes complete with a tiny screwdriver to remove the cover fitted to the expansion connector on the back of the VZ200 — a very thoughtful idea. There is also a "peripheral" connector, but the only peripheral mentioned in the manuals is a printer interface. Apparently the VZ200 firmware includes screen dump routines for use with a Seikosha GP100 or GP100A printer.

Programs are provided on cassette: I received some serious software like a cash flow program, but mainly games. Perhaps I had been spoiled by the higher quality graphics of other micros, but I wasn't over impressed with all of the games.

Since the VZ200 is (so far as I know) the cheapest home computer on sale in Australia, my comments could be considered harsh. But providing you are aware of its limitations the VZ200 should be good buy.

Processor	Z80
RAM	8k (Unable to determine usable RAM)
ROM	16k
Ease of use	★ ★
Ease of programming	★ ★ ★
Expansion and accessories	★ ★
Documentation	★
Presentation	★ ★ ★

Benchtested: Vol 4, No 4 (April 1983)

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COMX 35



Cheap home computers have something in common with train sets — they are essentially toys which either spark a serious interest or end up at the back of a cupboard. Sometimes the train set becomes part of a model railway, sometimes (however good a set it is) it must be scrapped in favour of equipment that conforms to popular standards. The COMX 35 has a number of attractive features and could be great fun, but in many ways it is quite different from other systems.

At first glance, the display seems quite ordinary with 40 columns and 24 lines, but it has some unusual features. Characters typed by the user appear in a different colour from those produced by the COMX, with white and light blue as the initial pair. There are eight colours and twelve pairs, so not all combinations are allowed. The background can be set to any of the colours. The character set is essentially upper-case ASCII plus a selection of graphic symbols (including three which together form a reasonable representation of a 747). Does that sound mundane? Well, the appearance of each character can be redefined — any cell in the 6 x 9 matrix can be set 'on' or 'off', and each row of the matrix has its own 2-bit colour code. This gives a choice of four colour pairs, as 'typed' and 'printed' characters are shown in different colour combinations. When a character is redefined, all occurrences on the screen change immediately. This ability to redefine characters is very useful for arcade-style games, as it allows complicated shapes to be 'drawn' in as little time as it takes to print a few characters, or a limited kind of animation achieved by repeatedly redefining characters. The disadvantage is that the programmer must describe the shape as an 18 character hexadecimal string (i.e. 9 bytes — one for each row of the character, the first two bits of each giving the colour code, the remainder being the 'bit map' for that row). There are no facilities for drawing lines between arbitrary points, although a dedicated programmer could produce specific effects within the limitation of the number of characters available.

The quality of the picture was not particularly good, despite careful tuning and adjustment. The TV lead presented two problems: firstly, it was much too short, making me work within a couple of feet of the screen. Secondly, the lead was fitted with a 'co-ax' plug, while the UHF input to my TV is designed for ribbon cable. This was not the case with a borrowed set, however.

Like many cheap computers, the COMX is small, light, and appears to be nearly all keyboard. As calculator keyboards go, I found it reasonably easy

to use. The biggest problem was the built-in joystick, as this is wired in tandem with the keyboard and generates invisible characters. If a line looks ok, but generates a syntax error, the likely reason is that the joystick was accidentally knocked while it was being typed. A weakness of the joystick is that it only generates four codes (for up, down, left and right), so diagonal movement is not possible.

The COMX can produce sound effects through its built-in speaker, the quality being typical of machines in this class. The Basic interpreter provides statements to generate white noise, continuous tones, or musical notes (eight octaves), with an overall volume control command. The speaker echoes the cassette signal when programs (or data) are being loaded or saved. Data files are not supported, instead the data area of memory can be transferred to and from tape in much the same way as a program. The relevant commands are PSAVE, PLOAD, DSAVE, and DLOAD (P for program, D for data), illustrating the idiosyncratic nature of this interpreter.

Another nice touch is the ability to schedule the execution of a subroutine after a period of time has elapsed. The TIMEOUT statement specifies the starting line number of the subroutine, while TIME is used to give the delay (in 1/50ths of a second). This could be useful for a variety of purposes, especially when programming games.

Most of the usual commands and functions found in a smaller version of Basic are present, plus several unusual items. Some have already been discussed, the others include FVAL which evaluates a string which contains variable names, numbers and functions, e.g. FVAL("3★SQR(A)"), FORMAT which specifies the field width used when printing numbers, FIXED (number of decimal places), and DEG and RAD (to allow degrees or radians to be used in trig functions). RENUMBER AND TRACE are also included. Programs may be accelerated by using the RUN+ command instead of RUN, as this pre-processes the program by determining the actual addresses involved in branches like GOTO statements. One of the worst features is that errors are reported by number (e.g. ERR CODE 30) instead of using informative messages (code 30 actually means "Unacceptable last character in PRINT statement"). Running a close second is the restriction of variable names to a single letter (or letter plus a dollar sign in the case of strings).

A mini-editor is provided, allowing the correction of a Basic line without retyping. It isn't sophisticated, but it makes the correction of minor errors much easier. A simple screen editor (a la Commodore) would be even simpler to use. Overall, Basic supports the hardware features of the COMX very well, but I would not like the task of converting programs to or from this machine.

A selection of expansion options for the COMX are mentioned in the advertisements (including extra memory, serial ports, ROM packs, disks, and other languages) but no accessories were received for this review. The only manual accompanying the system is called "Introduction to Basic Programming", but it does contain setting up and other instructions. I came to like the manual — it has the occasional quaint phrase, but it treats programming as an enjoyable, if serious, subject: "Have fun and both grow and

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glow". A reader harbouring suspicions that programming is boring could easily be put off by this approach.

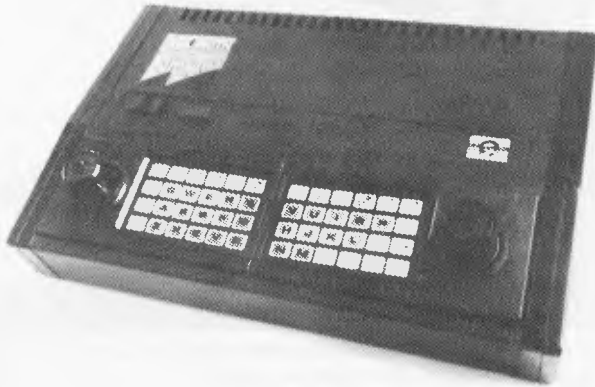
The main problem with the COMX is that it is incompatible with just about everything else on the market. It uses an uncommon processor chip (the 1802) and a unique dialect of Basic, so I suppose it is like a train set that seems to be good value but built to a different scale from everyone else's product. You get a lot for your dollar initially, but what about the longer term?

Processor	1802
RAM	35k (Approx 30k user RAM)
ROM	16k
Ease of use	★ ★
Ease of programming	★ ★ ★
Expansion and accessories	★ ★
Documentation	★ ★
Presentation	★ ★

Benchtested Vol 4, No 6 (June 13)

Review machine supplied by COMX (Australia) Sales, Clayton, Vic.

DICK SMITH WIZZARD



Unlike most of the micros in this review, the Wizzard is essentially a TV game that can be expanded into a home computer. Not surprisingly, it looks and feels like a TV game. The two hand controllers each have a joystick, two pushbuttons, and a membrane keypad. Most of the game cartridges have keypad overlays, but the only thing that changes is the look! When the controllers are put into the main unit they form a keyboard which is not so pleasant to use and there is an optional moving key keyboard. The keyboard fits into the space normally occupied by the controllers, which then plug into the keyboard.

The Wizzard generates a display which is good, but limited. Most of the usual adjectives can be applied to the picture (bright, sharp, steady, etc), but it has 24 rows of just 32 columns, of those, only 29 can be used when PRINTing from Basic, the others are accessed by the PLOT command (don't get too excited until you have read about the interpreter).

Various expansion units are mentioned (including memory expansion, a parallel and serial interface, disk drive and acoustic coupler), but the only one received (or included in the '83-84 Dick Smith catalogue) is the cassette recorder. This clips firmly onto the side of the Wizzard, giving a convenient and tidy unit. Pre-recorded tapes have an audio signal which can be heard through the TV's speaker. Presumably this is done by using a stereo recorder with the sound on one channel and the data on another, but no information is given that would let people make use of this feature with their own tapes.

The Wizzard includes an antenna switch box (making life so much easier), and all the cables are of a good length.

The Basic cartridge is an optional extra, and is supplied with an indifferent manual. As Basics go, this one is only average even though commands have been added to control the screen, controllers and sound effects. The big drawback is that graphics are not supported as such. The programmer must first define a character set suitable for his or her purposes, and then PRINT or PLOT those characters onto the screen. The use of color adds to the problems, as the 256 characters are divided into sets of eight, with each character in a set having the same foreground and background colors. There are 16 colors to choose from, including 'transparent'. Careful planning and a lot of work is obviously required if good use is to be made of graphics, but those with enough patience should be rewarded by some very pleasing effects.

Depending on the arguments, the JOY function returns the state of a joystick or pushbutton; and the SOUND command gives control over the three voice tone generator, the output of which can be heard through the TV speaker. There is no provision for the storage of data on tape.

Several cartridges were included with the review system, but in the main they were average versions of popular games. But they do serve as good examples of what can be achieved with the Wizzard's graphics.

Coming to the crunch: I can't really see why you would buy a Wizzard. If I wanted a TV game, I would buy something popular like an Atari or Intellivision (with a wide range of high-quality games), and many home computers already have plenty of programs and accessories.

Processor	6502
RAM	17k (11k user RAM claimed)
ROM	2k + 12k in cartridges

Ease of use	★
Ease of programming	★ ★
Expansion and accessories	★ ★
Documentation	★
Presentation	★ ★ ★

Review machine supplied by Dick Smith Electronics.

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SPECTRAVIDEO SV-318



The Spectravideo advertisements trumpet "Some computers are better than others. Ours is *much* better". They could be right about that, although I am not convinced about some of the comparisons they make, as they include or exclude extra-cost items to suit themselves.

So, what does the SV-318 give you for your money? There are a lot of nice things, plus a nasty rubber keyboard. The main problem is that you often get tactile feedback even though the keystroke hasn't registered — it is essential to press the centre of the key. A 'keyclick' can be generated electronically and this makes typing much easier, but tends to annoy other people in the room. There are five shiftable function keys which are genuinely user-programmable and therefore very useful when exploring particular features of the machine or when programming. A built-in joystick sits to the left of the keyboard proper, and the stick itself is removable for those who prefer a joypad. I was amused by the provision of two sticks, presumably in case of loss. One or two external joysticks may be added to the Atari-style connectors on the right-hand side of the case. Games enthusiasts are also served by the cartridge socket hidden beneath a spring-loaded flap above the keyboard. Unfortunately no cartridges were received.

The display was very good, with clear characters and graphics as well as nice solid colors. The text screen is a nominal 40 columns, but the default is 39, presumably to cater for TV screens with excessive oversean. The 24th line of the display may be used to label the function keys. There are two graphics resolutions: 256 x 192 and 64 x 48, both giving 15 colors plus a special 'transparent' code giving the current background color. The SV-318 claims to have 'sprite' graphics, but my understanding is that one of the attributes of sprites is that they have velocity, that is to say once set in motion they continue to move without explicit programming. The Spectravideo sprites lack this ability: they are essentially programmable shapes that can pass in front of or behind each other. They still simplify the programming of animated displays, and the easy detection of collisions helps arcade game designers.

The 80 column capability mentioned in the advertisement is obtained by adding an 80 column card, but the expansion is a prerequisite. I believe purchasers will appreciate the switch box included with the system which selects antenna or computer input to the television without unplugging leads. The leads supplied with the SV-318 are reasonably long.

The version of Microsoft Basic that is built into the Spectravideo is very similar to that used on the Tandy Color Computer and the Hitachi Peach, as well as the GW-Basic/Basic-A found on increasing numbers of 16-bit systems. The extensions cover graphics and other hardware features like sound and joysticks. The 'macro languages' for music and graphics are part of the implementation, but sound effects are not so easy to program: the SOUND command allows the user to load any byte into any register of the sound generator, but this is hardly better than the POKE or OUT commands that would otherwise be used. A screen editor is included, and benefits greatly from having the cursor position controlled by the joystick — it makes editing quick and easy.

The very powerful interrupt feature has been included, with interrupts being generated by the stop and function keys, joystick triggers (the space bar serves this purpose for the built in joystick), sprite collisions, and a 1/60th second timer. There are also commands for switching memory banks, but the manuals do not make clear what use can be made of this feature. Further commands allow the use of the audio channel of the Spectravideo cassette deck. This could be useful in educational programs, but again there was no cassette deck.

Good documentation is particularly important to buyers of home computers, as (unlike a business user) they cannot turn to consultants or support staff. The tutorial manual supplied with the SV-318 is fine as far as it goes, but it does little more than introduce the concepts of Basic programming and the features of the Spectravideo. I am particularly concerned about the way sprites are treated: the concepts involved are not brought out in the discussion and readers are left to discover the principles for themselves. 'Learning by doing' may have its advantages, but I would expect the information to be included somewhere in the documentation. Some hints may be found in the quick reference guide, but surely this should only be a memory-jogger? The problem comes down to the lack of a proper reference manual, so perhaps someone will publish "How to get the most from your Spectravideo" in time for Christmas (to any author working on such a book: *please* include a good index).

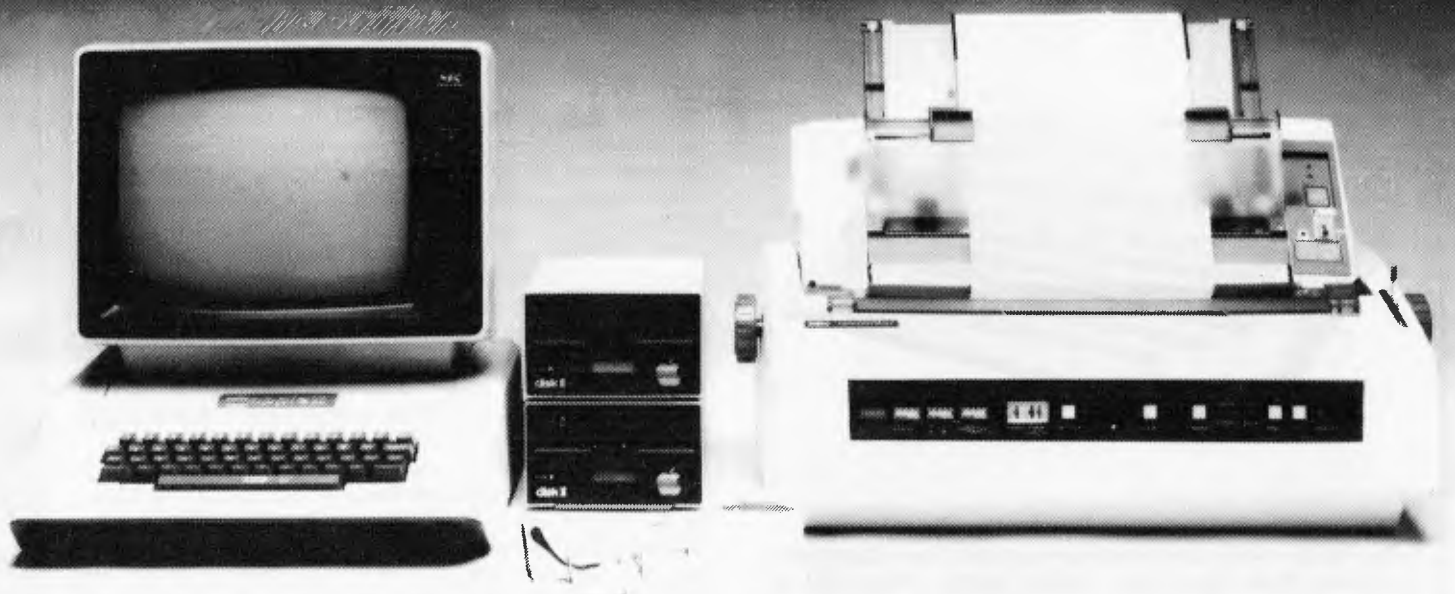
Overall, the SV-318 provides plenty of features at a modest price. The importers say that most of the optional extras are already available, although as the more important ones require the expansion box this should be budgeted for. The version of Basic used is powerful, yet very similar to those used on other machines. If it weren't for the keyboard, it would probably be on my wish-list.

Processor	Z80
RAM	32k (approx 12½k usable)
ROM	32k

Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★
Presentation	★ ★ ★ ★

Review machine supplied by VideoActiv Electronics, St. Kilda, Vic.

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SORD M5



One thing that must be said for the M5 is that it has the feel of a well-made product. Unlike some machines in this price range, it doesn't give the impression of being made by a company who decided to diversify from their business of making novelties for Christmas crackers. Even the keyboard is well above average, but it didn't change my opinion of rubber keyboards — I still prefer those made of rigid plastic. The keyboard has a capitals lock and a graphics lock which are very convenient. The state of the keyboard is shown by the cursor: an inverse-video G for graphics, L for lower-case, and C for capitals. The screen editor is another worthwhile feature.

The M5 has a built-in modulator for use with a TV, but a video output is also provided along with a separate audio signal. The M5 was unable to produce a color picture on either television used for this series of tests. The same thing happened with a second sample, so we tried with a third set and all was well. Perhaps the moral is to take your TV with you when you go shopping for a home computer.

Other connectors on the rear edge allow the use of a parallel printer, cassette recorder, and two joypads (joysticks without the sticks, if that makes much sense!). The separate power supply has a long mains lead, but a comparatively short cable connects it to the computer, which can be inconvenient at times.

The sleek lines are spoiled by the need to flip open the top panel to insert a cartridge before the M5 can be used. At least Sord took the opportunity to list the most commonly needed control and function codes on the underside of the lid.

The display can be used in several modes. For text display there is a choice of 40 x 24 (alphanumerics only) and 32 x 24 (text plus character graphics shown on the keyboard). "Multi-color" mode provides limited graphics on a 64 x 48 grid, while the "GII" display gives 16 colors, 32 sprites, and 256 x 192 resolution. Unfortunately, very little information is given about these features. The main problem seems to be that Basic-I (the standard interpreter) does not support many aspects of the hardware, so most users will want Basic-G which has a wide range of commands including interrupt handling. Both versions only provide integer arithmetic, so

there is a third option in the form of Basic-F.

Basic-I does have its good points, in particular it allows a label to be used as the target for a GOTO or GOSUB instruction. Other nice features are long variable names, auto line numbering, IF . . . THEN . . . ELSE, and a RESTORE statement that can reset the data pointer to a specified line number. There may be some provision for the use of sprites, but the manual was so vague that there was not time to investigate this possibility. A feature that has become commonplace is the single-key entry of Basic keywords; on the M5 this is achieved by holding down the FUNC key. Sord have made some sensible assignments with F for FOR, S for STEP, and N for NEXT. Of course, not every keyword can be matched in this way.

Two game programs ("Zac Basic" — an invaders variant, and a two player baseball game) are included on a cassette, but they seem to be machine code programs and so give no hints for Basic programmers. They do demonstrate many of the M5's hardware capabilities even though many of them are beyond the reach of Basic-I.

After the bulk of this review was written I had an opportunity to try the Basic-G and Falc cartridges. The M5 really deserves Basic-G, as it has many powerful commands for graphics programmers. I just cannot understand why it is not the standard interpreter. Falc is a spreadsheet with sort and select facilities, intended primarily for domestic use.

I was not particularly impressed by the Basic-I manual as many sections left me with the feeling that I had missed the point of the description or example. The Basic-G manual was much better, and I don't think its extra thickness is due solely to the greater number of commands and functions. This is another reason for beginners to purchase Basic-G.

It appears that there will not be a large range of accessories for the M5. The alternative Basic cartridges have already been discussed, as have the joystick game controllers. A 32k RAM pack, a printer, and an expansion box are mentioned in the documentation. What about disks and an RS-232 interface?

It is as if Sord haven't quite got round to finishing the job, although they have made a very good start.

P.S. Wasn't there an episode of Star Trek in which a computer called the M5 nearly caused the destruction of the Enterprise because of its inability to distinguish a war game from a real battle?

Processor	Z80A
RAM	20k (16k video, approx 2.5k user RAM)
ROM	8k (internal)
Ease of use	★ ★ ★
Ease of programming	★ ★
Expansion and accessories	★ ★
Documentation	★ ★
Presentation	★ ★ ★ ★

Benchtested: Vol 4, No 9 (September 1983)

Review machines supplied by Mitsui Computer Systems, North Sydney and South Melbourne.

TANDY COLOR COMPUTER



I find this approach much more convenient. The leads supplied were long enough for my room, but I do wish manufacturers would not skimp in this area.

The display quality was quite good, although the Tandy only offers sixteen 32-column lines of upper case characters in either green and black or red and yellow. The character set does not include lower case letters, but block graphics are provided (64 x 32 resolution) with eight colors (adding blue, buff, cyan and magenta). The 'real' graphic modes have a maximum resolution of 256 x 192 (two colours) or 128 x 192 (four colors). The allowable color combinations are black and green; black and buff; red, yellow, green and blue; and buff, cyan, magenta and orange. A feature that imaginative programmers could find useful is the ability to have multiple graphics pages, any one of which may be put onto the screen.

Tandy's Color Computer has been around longer than many of its competitors. When I first tested it, I was not particularly impressed by the keyboard, but when compared with some more recent systems it doesn't seem quite as bad after all!

One of the things I like most about the CoCo is the way the power supply and modulator are fitted inside the main case. Admittedly the case is larger than many other machines', but

Program Paks (i.e. cartridges) can be plugged into the side of the Tandy. They are mainly games, but there are also some educational and practical applications like a spreadsheet and a handyman's calculator (e.g. paint needed to decorate a room, amount of top dressing required for the lawn). There are also a few games and educational programs on tape, but the latter are intended for school use. One cartridge worth a

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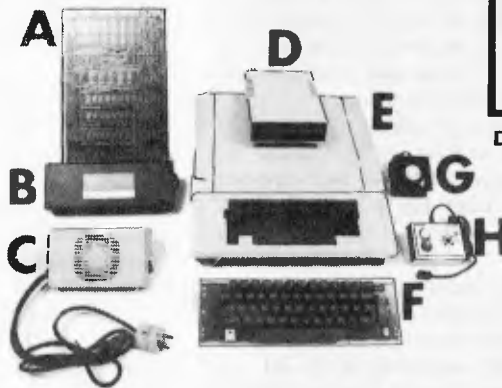
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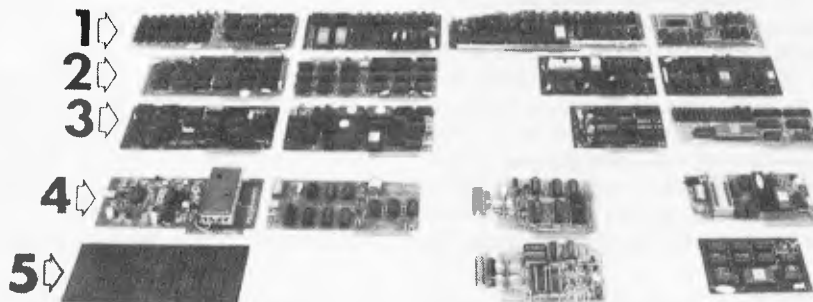
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mention is Color Logo, the "turtle" language designed to introduce children to maths and computing through geometry rather than arithmetic (at least that was the impression I got from Seymour Papert's book "Mindstorms"). It certainly encourages exploration, and I can see the attraction of a language which accepts some of the blame when things don't work out (no "syntax error" messages, just "I don't know how to . . .").

The Color Computer was (I believe) the first machine to use Microsoft's extended Basic which provides support for graphics, joysticks, sound and similar functions. This Basic is now found on a variety of computers, and I think it is a most desirable feature. There is a lower cost model of the CoCo which only has an ordinary version of Basic — in my opinion it is not worth bothering with unless only cartridge software is to be used.

No manuals were supplied with the review system, but I remember that the ones received for the original benchtest were of a high standard.

Several expansion items are available from Tandy, including disk drives (connected through the Program Pak socket), a small (but inexpensive) color printer-plotter, a graphics tablet, joysticks, and a digitiser. Machines without extended Basic can be upgraded, and 16k computers can have their RAM expanded to 32k (I have also heard of an "unofficial" modification to 64k allowing the use of Flex and other operating systems). A simplified RS-232 port is part of

the CoCo's standard equipment, allowing the connection of a variety of peripherals.

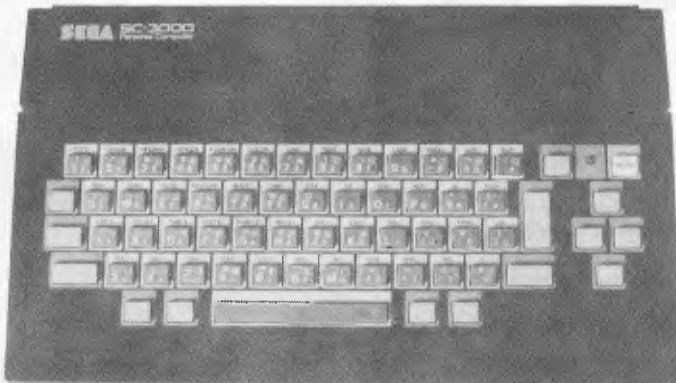
I still like the Color Computer, but for purposes other than games the 32 column display is restrictive (but better than the VIC's). It didn't sell as well as the VIC, probably because it was only sold through Tandy shops and dealers (an attempt to widen distribution in the US failed). There are a number of devoted owners in Australia, as shown by the existence of a magazine devoted to the machine (not a 'glossy', but a duplicated magazine crammed with machine-specific information). The problem facing Tandy is that the Color Computer now seems a little expensive compared with broadly similar systems.

Processor	6809
RAM	32k (approx 24k user)
ROM	16k

Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★ ★ ★
Presentation	★ ★ ★

Benchtested Vol 3, No 1 (January 1982) also Benchtest Special
Review machine supplied by Tandy Electronics

SEGA SC-300



I should make it clear from the outset that John Sands Electronics (Australian distributors of the Sega) provided a sample with pre-release documentation — some of it in Japanese, but most of it in the form of photocopied, typewritten, poorly translated English. By the time the Sega reaches the shops, everything should be fine (the color brochure is an impressive item), but it is likely that the "manual" I received has colored my impression of the computer. With that thought in mind, please read on.

My initial reaction on unpacking the Sega was "that looks nice — oh, not *another* rubber keyboard!" My fears were confirmed: the keyboard feels "dead", even for its type, and requires firm pressure for the stroke to register. Most keys have seven functions — upper case, lower case, control character (i.e. ASCII codes 0 to 31), graphic, shifted graphic, basic keyword, and "dieresis" (accented, Greek, or other foreign-language character). The GRAPH key acts as a graphics-lock (the cursor changes to denote the mode), but

the DIERESIS key works in the manner of a conventional shift key). Shift lock is obtained by typing a control character (I forget which, but do you really care?).

Other special keys include the cursor cluster, INSErt/DELEte, HOME/CLEAR (all for use with the Basic screen editor), BREAK and RESET. Shift-BREAK has the useful function of switching between the text and graphics displays.

The display quality was very high, certainly as good as any other machine described here. With 16 colors (counting 'transparent'), 32 sprites (the kind that must be explicitly moved around the screen), and a graphics resolution of 256 x 192 the Sega can hold its own against the competition. A switch box is provided for use with a television (so you don't need to keep unplugging the antenna), but there is also a video output allowing connection of a monitor.

When working with the text (24 rows of 38 characters, by the way) it is possible to redefine the character set, a facility which can no longer be regarded as unusual.

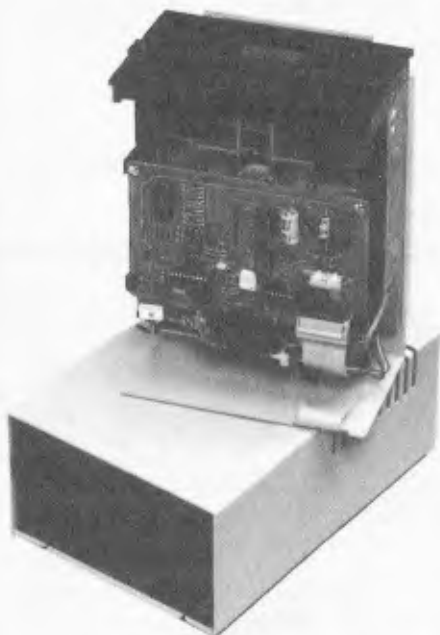
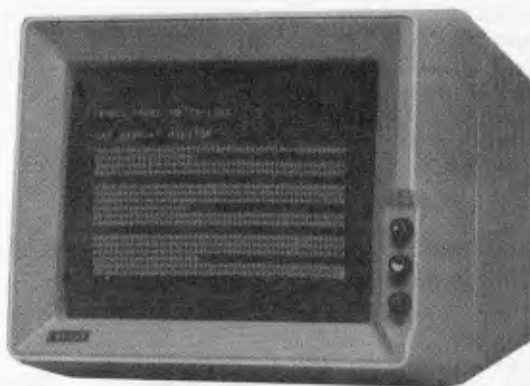
There are two joystick interfaces, but the joysticks themselves cost extra and are not particularly good. As Sega use two buttons on each joystick, other manufacturers' controllers could not be used. The other interfaces are for a cassette recorder and a printer (my guess is that it is a simplified RS-232 port, a la Tandy). The brochure mentions a color printer, an expansion unit, disk drives, and an acoustic coupler, which are all future (rather than actual) products. A worrying point is that the only way of adding more RAM is to purchase a replacement Basic cartridge which contains additional memory — this seems unnecessarily expensive to me.

I think it is worth mentioning that the Sega is fitted with an on/off switch and a pilot lamp — certainly better than



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having to pull out the plug when you manage to crash the machine beyond the reach of the reset button (not that I managed to do that to the Sega, but there were times when I wished that other micros had an on/off switch).

The Sega's Basic is Microsoft extended color Basic, providing pretty good support for the graphics (including the sprites), sound (the usual three channels) and the other hardware features. One graphics command that I hadn't noticed before was POSITION — this allows the programmer to specify which screen pixel has the co-ordinates (0,0), and in which direction the axes increase in value. This makes it as easy to plot a third-quadrant graph as a first-quadrant one, or even to make the centre of the screen the origin of the graph. HCOPY is another potentially useful command, producing a printed copy of a (text) screen.

A few games cartridges were supplied with the Sega. They weren't especially novel, but they *really* were of arcade quality. I was not surprised to read in the brochure that "Sega Enterprises is one of the world's top three producers of computerised, electronic arcade games".

When the various expansion items appear, the big question will be whether or not third-parties will produce software for the Sega — all Sega themselves promise is at least one game a month. That keeps games addicts happy, but cartridges cost about twice as much as programs on cassette, and what about those people who have more serious uses in mind?

Processor	Z80A
RAM	18k (approx 12k user RAM)
ROM	32k
Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★
Documentation	
Presentation	★ ★ ★ ★

Review machine supplied by John Sands Electronics.

ORIC-1



The Oric is in many ways typical of the computers examined in this article, but it does have some features which set it apart. It is not as attractively styled as some of the other machines, but it does have an unobtrusive design.

The keyboard came as a pleasant surprise as it has an unusually positive action for a calculator-style keyboard — it reminded me of a Hewlett-Packard calculator I once used. It is better than most keyboards of this type (e.g. the one on the COMX), and far superior to the rubber jobs on many of its competitors. It even has a space bar! The cursor control keys are placed either side of the space bar, an arrangement that is not as intuitive as a separate diamond, but is nevertheless convenient.

Getting tapes to load was not an easy task. I found it very difficult to find the right volume setting, but fortunately tapes recorded at the "slow" speed are much more tolerant. "Slow" means 300 baud, compared with the default speed of 2400

baud — in other words, a program that loads in two minutes at the fast speed takes over a quarter of an hour at 300 baud. Once I had found the right volume setting, most attempts to load were successful. Tuning the TV to the Oric's signal was also tricky, but worth the effort to get a good picture.

The display gives the usual eight colors in foreground and background and can be used in a variety of ways. The text display is 28 rows of 40 characters, but in practice only 38 positions are available due to the Viewdata format adopted by Oric. Advertisements in UK magazines show an Oric being used as a Prestel (British Telecom's Viewdata service) terminal. The Viewdata character set includes double height and flashing characters as well as block graphics, while the Oric also allows the redefinition of characters.

The Oric's Basic interpreter provides quite good support for the hardware. For example, it is possible to vary the type of line drawn (e.g. dotted, chained, solid, dashed) by using the PATTERN command, which also affects the result of using the CIRCLE command. CHAR permits the placing of text anywhere on the screen. There seems to be a restriction in the graphic area in that horizontally adjacent blocks of six pixels share a foreground/background color combination.

Four sound effects are predefined (EXPLODE, PING, ZAP, and SHOOT), and other noises and tones can be produced with the MUSIC, SOUND, and PLAY commands. There are three separate sound channels for use, but as there is no overall volume control there is no way of quietening a noisy program without changing the code. Each channel has separate tone and noise "switches", plus controls for envelope shape and period.

Other less common features include GRAB and RELEASE (to allow the use of the graphics display RAM for program or data), REPEAT... UNTIL to cut down on the use of GOTOS, and POP and PULL which take the top item from the Gosub and Repeat stacks respectively (useful when it is necessary to escape from a deeply nested section of code, possibly because the user gives up). TRUE and FALSE are both reserved words, generating the appropriate logical value — this could make some programs much clearer.

The Oric manual is clearly written with plenty of examples.

and is better than the typical manual. The Basic reference section would benefit from a little more detail, but there is plenty of useful material, including the 6502 programming model and instruction set. There is also a chapter on machine code programming, which includes an explanation of how the user may define one command and one function ("!" and "&" respectively) to access his machine-code routines.

A Centronics compatible printer interface is provided (a four color printer-plotter is available), and an "expansion bus" connector will allow the attachment of other peripherals like the forthcoming 3" disk drives and direct-connect modem.

Some games programs were provided with the test machine, and although the games themselves were nothing unusual (e.g. space shoot-'em-ups, adventure) the presentation was generally good and the graphics impressive. Although none of the games I saw needed joysticks, an adaptor is available which allows the use of Atari-style joysticks. The Oric is selling well in its home country (the U.K.), so a continuing supply of good software can be expected. There are already some serious programs (i.e. not games), and more can be expected. The arrival of the disk drives should make a big difference to this area.

The most obvious competitor for the Oric is the Commodore 64, but (at the time of writing) the 64 costs \$100 more. The Commodore has the advantage of a conventional keyboard and sprite graphics, while the Oric has a much more comprehensive Basic and may be used with an ordinary cassette recorder (with a much higher loading speed). You pays yer money, and yer takes yer choice.

Processor	6502
RAM	64k (approx. 38.5k user RAM)
ROM	16k
Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★ ★
Presentation	★ ★ ★

Review machine supplied by Panatronics, Mount Albert, Vic.

ATARI 400



The Atari 400 has been with us for some time now, and is starting to show its age, at least in terms of price-performance. Atari have launched some new machines, but the 400 is the one that comes within the scope of this article.

One big advantage of the 400's maturity is the amount of software available, especially game cartridges from Atari and other manufacturers. Something that separates Atari games from programs for some computers is the smoothness that they exhibit — you do something, the Atari reacts consistently (barring mechanical problems with the joystick). The games orientation of the machine is illustrated by the fact that it has not two, but *four* joystick ports. I suspect that many purchasers of the 400 actually wanted a video game system, but salvaged their consciences by choosing the computer instead.

When used as a computer, the Atari 400's biggest drawback is its keyboard — a membrane affair which is only marginally improved by the small ridges surrounding each "key". Readers who have yet to buy a micro may be wondering why I keep harping on about keyboards: believe me, a grotty keyboard and an unsteady display take much of the fun out of computing.

The Atari display is quite pleasant — it may be used in various modes, with different resolutions and color combinations.

The normal text mode is 40 x 24 in two colors, but another three colors become available if the number of columns is reduced to 20. A similar trade-off exists with graphics: the highest resolution of 320 x 160 only permits one color, but four colors can be used at 160 x 80. Judging by some of the articles on the Atari that I have read there are many tricks available to the skilled graphics programmer that aren't directly supported by Basic. The Basic commands are not as comprehensive as those provided by more recent computers, but they do provide facilities for drawing lines, plotting points, and filling areas of the screen. There is also a pair of commands which gives direct access to the display buffer.

Other features of Atari Basic give control over the four channel sound generator (using the TV speaker), provide error trapping and allow the use of joysticks and paddles. One strange feature is that while Basic allows long variable names (up to 120 characters), only 128 variables can be used in a program.

Although no add-ons beyond a joystick and a bunch of cartridges were provided for this review, it seems that there are disk drives and other accessories available for the Atari. One thing that struck me as a good idea is the way cartridges fit right inside the machine — a spring loaded flap pops open to give access to the cartridge slot, automatically turning off the Atari to prevent damage to its circuits.

The Basic Reference Manual is precisely that — no attempt to teach programming, but if you need to look something up, there's a good chance that you will find the information you want without too much trouble. There are a few sample programs to help things along, and there are plenty of examples in the text. Raw beginners are served by the self-teaching guide "Atari Basic", a gentle but thorough introduction to programming the Atari.

When the 400 first appeared, it was something out of the ordinary, but now it seems rather dated. Recent machines tend to be smaller and are usually cheaper, so it's a good job that Atari have their new models organised.

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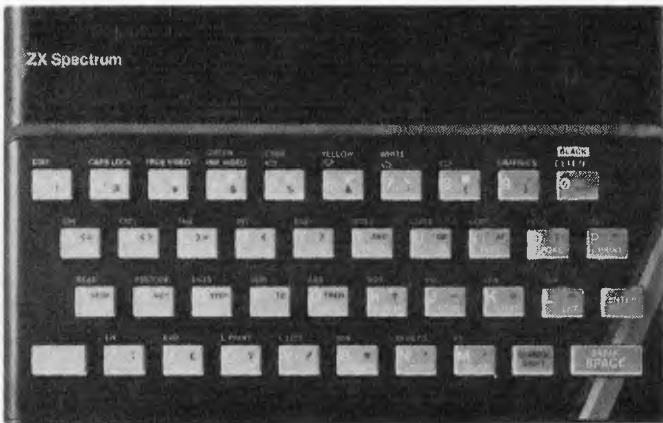
TEOE2098

Atari 400

Processor	6502
ROM	10k (plus cartridge, e.g. 8k Basic)
RAM	16k (approx 13k user RAM)

Ease of use	★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★ ★
Documentation	★ ★ ★
Presentation	★ ★ ★

SINCLAIR ZX SPECTRUM



It has taken the Spectrum a long while to reach Australia — whether this was the result of wrangles over the name “Spectrum” or because priority was given to the UK market makes little difference. What is important is that since Sinclair launched the Spectrum a vast quantity of software has been written, so purchasers will be able to choose from an extensive range of programs. As is usual with this type of machine, the majority of the programs are for entertainment (you can look forward to several “Screenplays” devoted to the Spectrum). They are not all arcade games though: for example there is a Scrabble program reputed to be a worthwhile opponent for most people (not being a Scrabble addict, I can’t comment), and a rather nice graphic adventure based on “The Hobbit”. A copy of the book is provided as a source of clues. There are a few serious programs, in particular the ubiquitous spreadsheet and filing system, but once the Microdrives (low cost, high-speed tape storage devices) get into the hands of Spectrum users the supply and demand for such software will rapidly increase.

What’s in a Spectrum? Very little, due to the use of an Uncommitted Logic Array (ULA) in place of the normal collection of logic chips. There’s a CPU of course, plus ROM and RAM, but apart from that almost all the work is done by the ULA. About the only area which uses separate components is the circuit which converts the picture output of the ULA into a form that your TV can cope with. This low parts count is one of the reasons why the Spectrum is so cheap (at least in the UK, where the 48k model costs only 130 pounds, say \$225 — that’s *retail*, remember). While on the subject of the machine’s innards, there have been some changes since the Spectrum was Benchtested. The most significant difference is that the upgrade from 16k to 48k no longer uses a piggyback board as there is now space on the main pcb for the extra chips.

What you actually see is a compact, quite attractive black box with a grey (all together now) rubber keyboard. Like most of these small computers you connect the plug pack, and your

cassette recorder and TV, then off you go. Something I liked was the way the screen border changes color and flickers when you are loading a tape, so you know that something is going on. Many micros appear to go into a trance when loading, it’s much more satisfactory to know that something is going on. Loading from cassette presented no problems except for the time when I (blush!) connected the plugs the wrong way round. All the programs I tried made use of the auto-run feature that can be invoked when a program is saved, and many of them put a “title page” onto the screen before loading the program itself. It seems easy to do, and it looks rather good.

The keyboard seems to allow more movement than most of its kind, but apart from that it is no better or worse than the others. A small speaker inside the case emits an electronic keyclick very quietly. Unlike the majority of small computers, the Spectrum *insists* that you use single-key entry for the reserved words in Basic, but it is made easier by the machine interpreting the keystroke according to context: if it expects a keyword, that’s what it reads, otherwise it takes the single character. The system is complicated by the use of separate CAPS SHIFT and SYMBOL SHIFT keys, but once you begin to use the machine things suddenly become clear. There are three other modes: CAPS LOCK and GRAPHICS (both self-explanatory); and extended mode which is entered by pressing both shift keys and allows the remaining characters and tokens to be accessed. Because there are so many modes, the appearance of the cursor indicates the state of the machine, with an inverse K for Keywords, L for Letters, C for Capitals and so on.

The Spectrum uses an unusual split-screen arrangement. The lower section (it starts as two lines, but can grow if necessary) is used to show whatever is typed at the keyboard and to display error messages, etc. The remainder of the 24 lines is used in the normal way by PRINT statements and graphics commands. Instead of talking about background and foreground, the Spectrum works with PAPER and INK (choose from red, green, blue, yellow, magenta, green, white and black). Each character position has its PAPER and INK controlled separately and the programmer can also cause the character to flash. On top of that, there are two levels of brightness and it is possible to overprint one character on another.

On the graphics front, there are 21 user-definable characters, and sixteen pre-defined quarter-square characters, as well as 256 x 176 pixel graphics. Care is necessary when the pixel graphics are used, as all dots falling within a character position share the same display attributes (paper, ink, etc). These high resolution graphics are used from Basic through commands which generate dots, lines, arcs, and circles. Some of the games I tried made very good use of the display, with results that rivalled images I have seen

GOTO page 172

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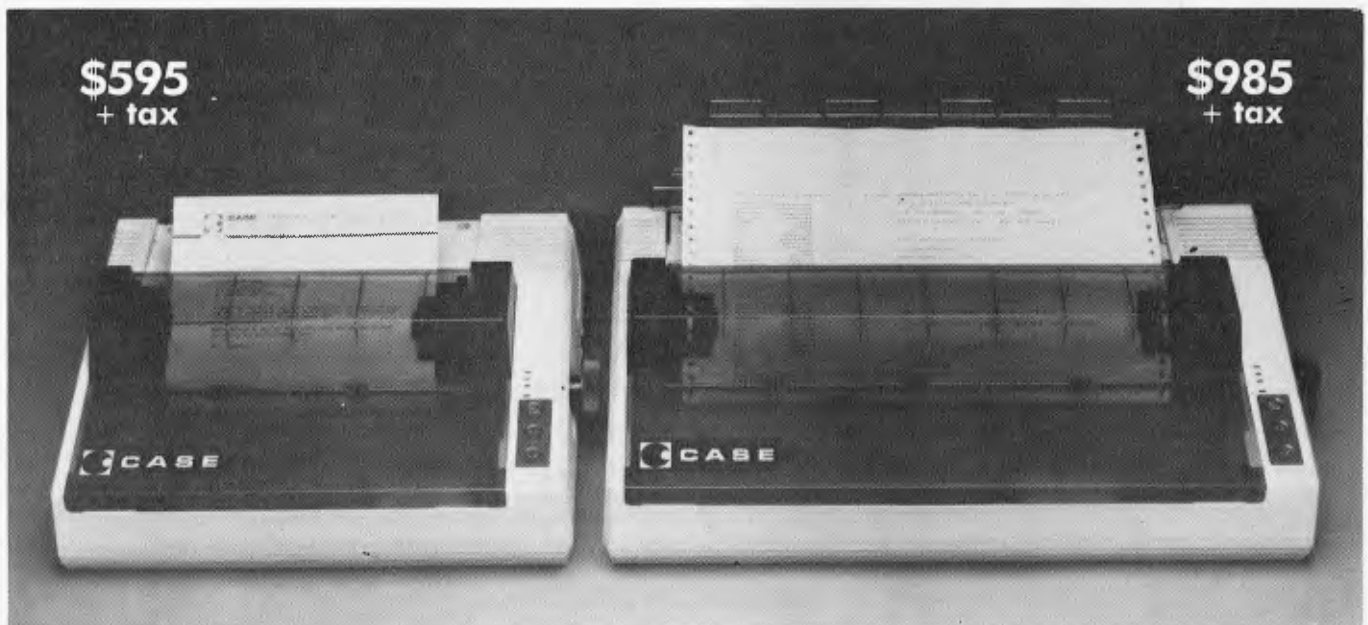
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BANKS' STATEMENT

TOP OF THE POPS

The public relations man looked simultaneously horrified and perplexed. There may also have been a touch of cynicism thrown in for good measure.

'Cedric?' he asked, incredulously.

'Yes,' said a small, acned individual of perhaps thirteen tender and sheltered years.

'No-one is called Cedric these days, are they?' the PR man felt there was nothing left to do. Young Cedric may be brilliant—everyone said his new games program was one of the best ever—but there was no way the PR man could make either the boy or his product a worldwide success without some drastic surgery.

Acne was one thing, it could even be made vaguely romantic with a great deal of effort. But there was nothing else for it, that name would have to go.

Six hours and a bottle of gin later, the PR man returned to his bosses wearing a slightly incoherent smile and slurred 'got it, got the whole package worked out. There's only one way Shedric's program is going to be a success. Gotta go back to the old days, like when we was in records. We're gonna hype the little devil till it hurts.'

And so it was that small, acned Cedric Arbuthnot became Ivan Andov, the genius son of a white Russian emigre, who was discovered busking VIC-20 programs on a street corner. The acne was now an obscure, incurable skin disease picked up when his late, aristocratic mother was a cabaret programmer in a Bangkok system house supper club.

His games program, originally called Tax Avoidance Routines No 1, was rechristened Jason in the Caves of the Cay Man and went on to make its publishers—formerly a major record company—immensely rich. It would lend Ivan money when he needed it or send him out on promotional trips in a borrowed Rolls Royce.

There ends, for the moment at least, this month's Story Time, and let me stress that, at this point in time, it is a story with no basis in truth. But that is only as far as I know, for I have a feeling that if it isn't happening now, it soon will be.

You see, several things have come to light recently that point to a new development in the business. Individually they are not worth repeating, but together they show that another analogy between com-

puters and the record industry is showing up, and that it is an analogy that is not altogether wholesome in its connotations.

That analogy is, in one word, *hype*. Now that there is a sizeable installed base of home computers out there, the software industry is scrambling to jump on the bandwagon. Quite right, too, I hear someone say, and I agree with you—but only up to a point. With such a vast market growing more crowded with new games and hobby programs every day, something has to be done to get them noticed.

There was a time when all that was needed was a cheap advert in a magazine

'Other companies might take a different approach and try to hype their way to success.'

not totally dissimilar to *APC*. The world was small enough then for it to be seen and noticed. Today that is not liable to be enough.

Already the advertisements are getting bigger and grander (and so they should the publishers say). The authors of the programs are beginning to be publicised as personalities, which indeed some of them are. There are 'pop' charts showing which programs are selling best. It gets to look more like the record industry every day.

And, of course, the way things are going, that is exactly what it is going to be. The record companies, observing the diametrically opposing trends in sales potential of the record business and the home computer software business, are about to decamp from the former to the latter *en masse*. (OK, so they're not necessarily actually going to give up the record making business, but they do know a good thing when they see one.)

As such companies move in, several things are likely to happen. One is that the home software business—games and stuff like that—will go from being shoe-string to the other thing. When it comes to promotional efforts, the megabucks are about to start flying around. What we have seen so far in software promotion has been kids stuff carried out on small change. These efforts have been worthwhile for many of the participants it is true, but now the big boys are coming out to play.

Another thing that is likely to happen is that, despite their acknowledged financial clout, there is no natural follow-on that what record companies spend their money on promoting will be any good. As was witnessed in the sixties, when the record companies took the world apart trying to find their own version of the Beatles, they are expert at following the trends poorly, and not nearly as good at picking the right new, and unknown, developments. If they are so weedy in their own back garden, it could be fun watching them treading in the doggie-do of a strange and new business.

This is where it could get interesting, for each of the companies will no doubt have its different approach. Some, I feel sure, will want to hedge their bets and cut corners by buying in the expertise. This will probably be in the form of one of the small but successful publishing companies that lack, above all else, finance.

This, in my own extremely humble opinion, would not necessarily be a bad thing. Indeed, it could be beneficial to all concerned.

Other companies might take a different approach and try to hype their way to success. It has been found before in the record business that enough money can sometimes push a product to the top despite its quality (or lack of it). The methods of achieving this are not all that wholesome either. The record industry itself has had to come to terms with the sometimes gross manipulation of the pop charts. Get something in the charts and it will become 'sellable'... so do what you have to in order to get it in the charts: that has been the motto.

Even now this cannot be guarded against completely in the record business, and in the software business, the 'charts' are wide open to every con going. I have no specific evidence for what follows but, when someone in the business says to me that chart manipulation is going on, and that his suppliers are saying that a little financial inducement in the right direction will ensure that a program gets to the top in the next issue of a magazine, then there is an outside chance that it might not be all a pack of lies.

And already the power of chart positioning—manipulated or not—is being felt. In the US, retailers are finding that they must watch the magazines closely and stock up on the ones that gain both the high spots in the charts, and the



good reviews. Getting a five-star rating in a magazine means a program gets sales. It follows that there is a potential for some unscrupulous companies to try to acquire such ratings.

The ratings are important because the users have so little else to go on in choosing new programs. This is why the authors are likely to become personalities in their own right, for in the same way that the music business sells on the name of the artist (if you like Rod Stewart or Men at Work, you are much more inclined to buy their new records just because you know you like them), so the software business will follow suit.

Good games writers are liable to

become 'stars' in their own right. They are also liable to become as rich as many pop music stars of today, and this is attracting another problem for the industry. Having read of the money some of the early 'stars' are making already, kids are starting to clamour to become stars themselves. Worse still, parents are dragging reluctant children along to publishers, just because they have bought a VIC and can make it print 'Get lost' . . . smart kid, eh?

One instance of this I have heard of had parents demanding an advance royalty of \$75,000 from a games publisher for a new game written by their 'brilliant' spotty kid. Two things prevented the transaction in the end. One was that the

publisher had been around a bit. The game the kid had 'written' was in fact an old 8k PET program copied and modified. The kid had found it at school. The publisher remembered playing it himself all those years ago (three?). Without an archive, museum and indeed some copyright laws, there is going to be much more of this.

The other reason he didn't do a deal? Oh yes, he didn't have \$75,000 in spare cash at the time. The record companies, of course, will have. The time is coming to buy lots of Kleenex, for there are going to be some wonderful colds caught in the near future.

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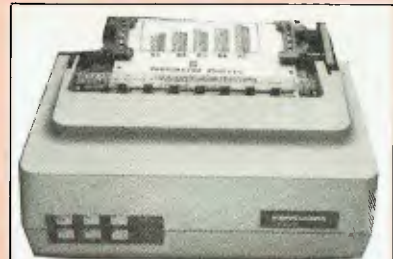
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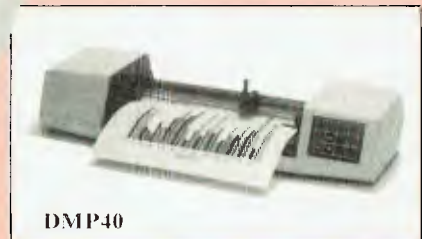
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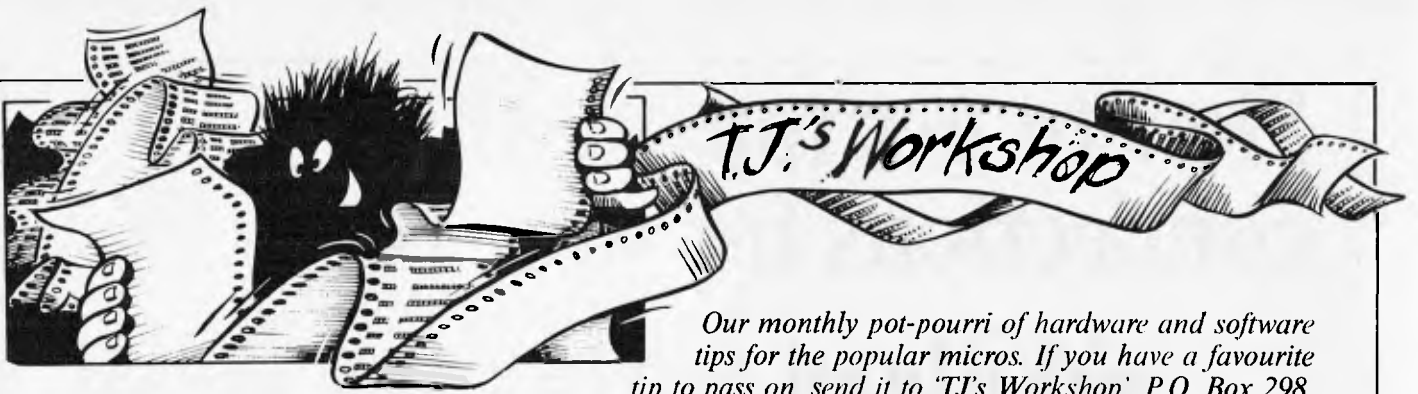
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Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to "TJ's Workshop", P.O. Box 298,

Clayton, Vic. 3168. Please keep your contributions as concise as possible. We will pay \$10—\$30 for any tips we publish. APC can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

CP/M hints

A great deal of time can be saved in certain circumstances if you know the odd trick or two.

Have you ever typed a line such as:

PIP B:=A:ACBD.BAS
only to discover ACBD.BAS does not exist and you meant to type ABCD.BAS?

At that stage you are not really sure what the file ought to be called and so you type DIR to look at the directory and then retype:

PIP b:=A:ABCD.BAS

You needn't have bothered. DIR is a built in command so it does not load into memory and then run like user programs. Thus PIP which you loaded into memory was not overwritten and is still there. If only you could get the CPU program counter to point to the beginning of PIP's code and run it, you wouldn't have to re-load it.

Easy! First save a zero length file. In other words create a directory entry for a non-existent program. I call mine GO.COM. Thus, type the following line and then press RETURN.

SAVE 0 GO.COM

Now it doesn't matter what was in memory when your last program bombed out or finished. If you now type GO followed by {RETURN} provided it is not corrupted it will repeat whatever was in memory immediately before.

There are exceptions. Some programs use the whole of the transient program area including the bit at the top of the TPA used by the console command processors CCP. When a program ends, CP/M reloads CCP into memory so that it can process your next command and if your program is using this area, CCP will overwrite it and corrupt it. Very often data errors appear in this

area and so although a program might still be intact, its data may be corrupted and it still will not run. Nevertheless the arrangement works in most situations.

Typewriter Mode: If you use a word processing program, you probably know what a hassle it is to do little things. First you have to prepare a text file then save it and only then can you print it. However, in some circumstances you can use your keyboard exactly as you would a typewriter keyboard and as you press each key, the printer will print each letter. This does not work with all printers, but it certainly works with several that I have used and most can be configured to accept a single character and to print it without waiting for a carriage return. However, you must be able to send line feed characters to the printer. Some terminals have

a line feed key, and others do not and some you can configure under software control to do this (Sirius, etc).

What you have to do is: Type: PIP LST:=CON: and then press {RETURN}

What you have done is to map your printer on to your screen so that as you type at the keyboard whatever appears on the screen also comes out on the printer. The problem is that when you get to the end of a line you have to do both a carriage return and a line feed to ensure that your next lot of printing is on the next line. Once you have finished your document, envelope or similar, all you have to do is type a control Z. To do this you hold down both the control key and the Z key and you will then come back to the Command Mode.

Alan Secker

CP/M Backspace

One of the enhancements of CP/M 2.2 is that BACKSPACE (08H) provides a proper backspace and overwrite function appropriate to a video display. Unfortunately, my keyboard has no special key for BACKSPACE (08H). It does have a DELETE key (7FH) but in CP/M 2.2 DELETE acts in the same way as in version 1.4 — that is by echoing the offending character to the console.

The CP/M manual states

that the backspace can be changed to another character with a simple byte change. But it omits to say which byte! Unfortunately it is not enough simply to search for any occurrence of the instruction

```
CMP 08
```

in the BDOS, since this occurs several times and for purposes other than filtering out BACKSPACE. Changing the wrong occurrence of 08H is almost guaranteed to produce interesting though unexpected results! A more complete disassembly is called for. For the benefit of

others, the appropriate byte in my version 2.2 of CP/M is BDOS + 203H; that is byte 203H following the beginning of the BDOS.

The procedure is as follows. Use SYSGEN to get a copy of the CP/M into RAM. Then save this on disk. Find out where the BDOS begins in the SYSGEN image. In my system, this is at 1300H. Using DDT (or SID or ZSID), examine the byte 203H further on, eg 1503H in my case. This should contain 08H. Change this to 7FH and SYSGEN a copy of the modified CP/M onto your disk. Following the next

warn boot, your DELETE key should backspace in the expected manner.

If you examine the appropriate byte and find something other than 08H, then you must have a different version of the BDOS. My suggestion is to look for that area of the BDOS which deals with AE (05H), AP (10H), AX (18H), AU (15H), and AR (12H).

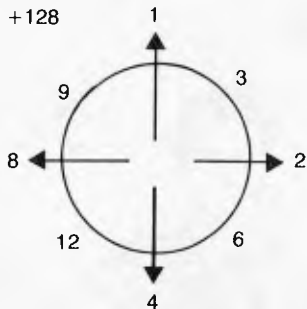
```
The  
CMP 08
```

immediately preceding this block of code is the appropriate one to modify.

Michael Carter

Joyful VIC

This VIC machine code routine takes 84 bytes. It is used to read Joystick input. The format is as follows:



If the fire button is pressed, the routine returns a *Gavin Darren*

value + 128, ie, JS = USR (0). If the joystick is pointed up and the fire button is pressed, JS would contain 128 + 1 = 129.

The routine is fully relocatable to anywhere in RAM, and is called by POKEing the high order address byte in location 2 and the low order byte in location 1, then using the USR command. It should be entered either via a monitor or by a hex loader.

```

.. 3F9C LDA #$00
.. 3F9E STA $9113
.. 3FA1 LDA #$7F
.. 3FA3 STA $9122
.. 3FA6 LDA $9111
.. 3FA9 STA $FB
.. 3FAB AND #$04
.. 3FAD ROR
.. 3FAE ROR
.. 3FAF STA $FC
.. 3FB1 LDA $9111

.. 3FB4 AND #$08
.. 3FB6 ROR
.. 3FB7 ORA $FC
.. 3FB9 STA $FC
.. 3FBB LDA $9111
.. 3FBE AND #$10
.. 3FC0 ROR
.. 3FC1 ORA $FC
.. 3FC3 STA $FC
.. 3FC5 LDA $9111
.. 3FC8 AND #$20

.. 3FC4 FC AD 11 91 29
.. 3FC9 20 2A 2A 05 FC
.. 3FCE 85 FC AD 20 91
.. 3FD3 29 80 6A 6A 6A
.. 3FD8 6A 6A 6A 05 FC
.. 3FDD 85 FC A9 D0 ED
.. 3FE2 FC 00 A8 A9 00
.. 3FE7 20 91 D3 A9 FF
.. 3FEC 8D 22 91 60 58

.. 3FD9 ROR
.. 3FDA ROR
.. 3FDB ORA $FC
.. 3FDD STA $FC
.. 3FDF LDA #$D0
.. 3FE1 SBC $00FC
.. 3FE4 TAY
.. 3FE5 LDA #$00
.. 3FE7 JSR $D391
.. 3FEA LDA #$FF
.. 3FEC STA $9122
.. 3FEF RTS
    
```

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T.J.'s Workshop

VIC PRINT AT

On the VIC 20, positioning of the cursor is usually done by homing the cursor and then PRINTing cursor control characters. This technique is tedious, and inadequate for use in games. However, I have developed a routine that does this quickly and easily:

```
1000 POKE 211,X:POKE
214,Y:SYS 58759:RETURN
```

where X is the column and Y is the row. Anything PRINTed after calling this

routine will appear X number of spaces to the right and Y number of lines down from the home position. For example, If X=0 and Y=0 and this routine is called, anything PRINTed would appear in the top left-hand corner of the screen.

There are a number of memory locations concerned with the positioning of the cursor. The machine code subroutine in ROM at 58759 reads the contents of 211 and 214 and alters the other memory locations accordingly.

James Saunders

Osborne AUTOST.COM

I am sure that, like me, most Osborne 1 users get fed up with the infernal "AUTOST?" message each time a disk is booted up. This is due to the absence of the file "AUTOST.COM" which is used to chain on the program "HELP.COM". The MBasic program shown will create a new file

"AUTOST.COM" which contains only one instruction, a Z80 RTS [CHR\$(201)], which tells the Osborne to return to CP/M without doing anything. The new "AUTOST.COM" consists of only one byte and a directory entry, so it does not take up much space. After this program has been run, whenever the disk is booted up, all that will appear is the 'A>' prompt.

Nick Wilson

```
10 ON ERROR GOTO 90
20 PRINT CHR$(26);STRING$(52,128):PRINT:PRINT
30 PRINT,"FIXING AUTOST.COM";
40 KILL "AUTOST.COM"
50 OPEN "O",1,"AUTOST.COM":PRINT1,CHR$(201):CLOSE
60 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
70 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
80 SYSTEM
90 RESUME 50
```

VIC clock goes faster

The TI clock on the VIC 20 can be set to update at intervals other than its usual 60 times a second. To do this, use a routine like this:
N=1109404.5/R
HI=INT(N/256)
LO=INT(N-HI*256)
POKE 37156,LO
POKE 37157,HI

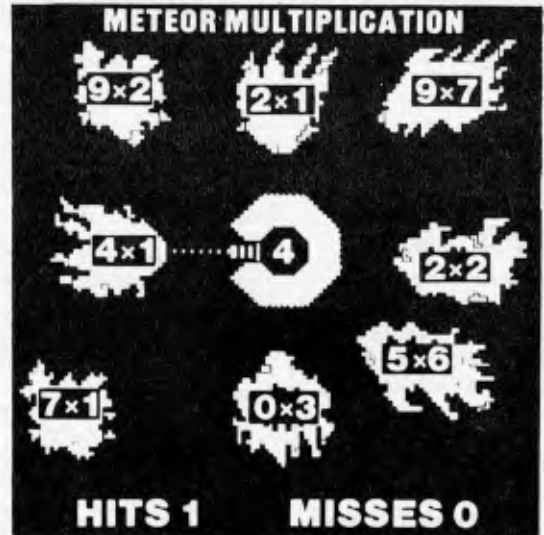
R is the number of updates per second. The slowest speed is about 17

times a second. Theoretically, the fastest speed is about 1.1 million times a second, but the more time the VIC spends dealing with the clock, the less time it has for everything else. Set the speed to 10000 and see how slowly it LISTS!

This trick could be useful to speed up programs — just set the clock at 17Hz. One unfortunate side effect is that auto repeat and cursor flashing are affected. Both use the TI clock for timing.

David Walker

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Health-giving Epson sorts

HX20 owners may have found the FILES command useful for identifying files on cassettes, but have been frustrated by not knowing the date a file was saved. Such a feature would be advantageous when more than one version of a program has been saved. Program 1 accesses this information, automatically saved in the header of each file stored on a cassette. This program will work for files stored on either of the devices 'CAS0:' or 'CAS1:'.

The program reads in a file header by opening a file for input. As Basic program files cannot be OPENed, error trapping in line 140 is needed. H% points to the area in memory used by the HX20 to store the header, accessed by PEEK statements. The area used varies depending on the device being used.

Elizabeth Wald

```

100 CLS:PRINT "Enter dev
ice no? ";PRINT "CAS(0):
CAS(1): ";CHR$(30);:D$
=INPUT$(1):' ENTER 0 OR
1
110 IF D$<>"0" AND D$<>"
1" THEN 100 ELSE D$="CAS
"+D$+":"
120 IF D$="CAS0:" THEN H
%=&H0320 ELSE H%=&H02D8:
' H% POINTS TO START OF
HEADER
130 CLS:LOCATE 2,1:PRINT
"Searching "+D$
140 ON ERROR GOTO 240:'
HANDLES ERROR FOR BASIC
PROGRAM FILES
150 OPEN "I",£1,D$+"*. *"
:' GETS FILE HEADER
160 F$="":FOR I%=0 TO 7:
F$=F$+CHR$(PEEK(H%+I%)):
NEXT I%:' GET FILENAME
170 E$="":FOR I%=8 TO 10
:E$=E$+CHR$(PEEK(H%+I%))
:NEXT I%:' GET EXTENSION
180 DA$="":FOR I%=28 TO
33:DA$=DA$+CHR$(PEEK(H%+
I%)):NEXT I%:' GET DATE
190 TI$="":FOR I%=34 TO
39:TI$=TI$+CHR$(PEEK(H%+
I%)):NEXT I%:' GET TIME
200 CLS:PRINT "File: ";F
$:" ";E$
210 PRINT "Date: ";LEFT$(
DA$,2);"/";MID$(DA$,3,2
);"/";RIGHT$(DA$,2)
220 PRINT "Time: ";LEFT$(
TI$,2);": ";MID$(TI$,3,2
);": ";RIGHT$(TI$,2)
230 CLOSE:GOTO 150
240 RESUME 160:' IGNORES
ERROR

```

Positive aspect to negatives

A ZX81 or Spectrum will produce an error if you attempt to raise a negative number to a power. To avoid this, use a short routine like this:

```
10 REM A=B**P ZX81
```

```
20 LET S=1
30 IF B(0) AND P=INT(P/
2)*2
```

```
THEN LET S= -1
```

```
40 LET A=S*ABS B**P
```

Obviously, on a Spectrum A is used instead of ** and lines 20 and 30 can be written as one line.

Ken Chua

The 64 waits on you

A 'press any key to continue' style pause on a Commodore 64 can be a bit fiddly because you ought to make sure that the keyboard buffer is empty before using a GET test.

One simple alternative is WAIT 197,191. This looks at the keyboard location (197) and waits until a key is pressed — that is, its value changes from 64.

David Gristwood

Straight to the point

This short subroutine in CBM Basic will provide a substitute for PRINT USING on any Commodore machine without this useful function.

The variable X is the number to be formatted, the subroutine returns a string V\$, which is the formatted

number. If X is a total it is desirable to round up or down to two decimal places using the expression X=INT(X*100+.5)/100, the maximum number of characters in V\$ is 10, including the decimal point, eg. 9999999.09.

D E Rolfe

```

5 REM **** DEMONSTRATION PROGRAM FOR DECIMAL PRINTING ****
10 INPUT N: X=N
20 GOSUB 9000: REM **** CALL FORMATTING SUBROUTINE ****
30 PRINT "S ";V$
40 END
8999 REM **** DECIMAL FORMATTING SUBROUTINE BY D.E.F. ROLFE 1988 ****
9000 Z$=STR$(X): W$="" : S=RIGHT$(Z$,3): F$=V$*2$
9010 IF MID$(Z$,1,1)="" THEN V$=V$+" " : GO TO 9040
9020 IF MID$(Z$,2,1)="" THEN V$=V$+"0 " : GO TO 9040
9030 V$=V$+"." : GO TO 9040
9040 V$=RIGHT$( " "*(4-LEN(V$))+V$) : RETURN

```

Atari down in dumps

This short two liner lists a cassette file to the screen on an Atari. Beside being useful for dumping cassette data files onto the screen or looking at unindexed tapes, it can be used to verify programs that have been

saved using LIST "C".

The routine dumps to the screen and so won't affect any program in memory. If all goes well, you'll get an EOF error at the end of the file.

```
10000 CLOSE #1: OPEN#
#1,4,0,"C:"
10010 GET #1,C: PRINT
CHR$(C): GOTO 10010
```

F M O'Dwyer

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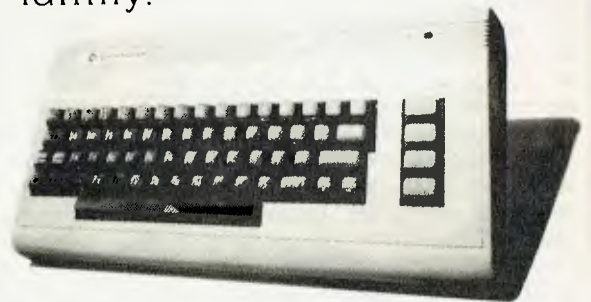
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PORTABLE PROBLEM

Personally, I think Adam Osborne has a lot to answer for. He used to write a column in the American trade newspaper *Infoworld*. Its title — 'From the Fountainhead' — irritated me a lot (you'd be laughed off the page for using that title here but apparently what we would regard as unspeakable pretension is quite acceptable in the US) but in it Adam often spoke a lot of sense, even when he was going against conventional microwisdom, which was often.

Eventually, he decided to put his money where his pen was and practise what he'd been preaching. And so he gave us the Osborne 1, one of the most successful ever computers. My immediate reaction, when I first saw and tried out an O1, was that he was playing some kind of cruel joke on us: the tiny screen, the horrible keyboard, the minute disk capacity, the flimsy casing, and above all the size and weight of what was billed as a portable computer — all seemed quite ludicrous.

As we now know, the O1 was a tremendous success despite all these apparent drawbacks — it has sold like the proverbial hot cakes and the recently-announced Executive model will probably be equally successful. Fine: thousands of people are happily computing away and the Osborne coffers have swelled suitably.

But what Adam did — intentionally or not — was to spark off a whole range of 'portable' computers. Other companies saw the success of the O1 and thought, 'If he can sell that many, there must be a big market for portables — we can make a machine which is lighter/better built/has a bigger screen/has bigger disks/looks better/etc and make money too.' So they did, and we have a whole flood of portable machines from which to choose.

But do we actually want portable computers like the ones now being offered? I can't speak for the States, where different values apply, but here I am certain, through conversations with people who use and sell the machines, that the O1 has not sold well because it is portable — it has sold because it is *very cheap* and comes with a useful amount of ready-to-use software. If it were twice the size and four times the weight it would still have sold well, provided it sold at the same price and came with the same software.

I must immediately stress that I'm not denying the usefulness or desirability of portables. But at the moment, we don't have the technology to build a really useful portable computer — we're still waiting for

a flat screen which will give a proper display of 25 lines by 80 characters. This is now the minimum acceptable screen size for serious use; if you disagree because you use a machine with a smaller screen and think it's great, then either you've not tried a 25x80 screen and don't know what you're missing or you're one of the minority which is happy with a smaller screen—most of us aren't in that category.

Here's what a portable machine should offer. Firstly, there's the flat screen display, currently not possible but generally thought to be available before too long. Apart from the size and weight advantages of something like a large-scale LCD display, it is far more rugged than a delicate CRT tube as used in most portables, and— even more importantly — it uses only a fraction of the power required to drive a CRT, making battery operation — and hence true portability — a reality. (I know there are some portables with battery packs but who really wants something which will only run for a couple of hours or so before you have to recharge the batteries?)

Mass storage is the next problem. Bubble memories were once the great hope of the portable builders but they have never really caught on well enough for the price drop resulting from mass production to come into effect and make them economically worthwhile in general use. They're too expensive, in other words, and seem likely to remain so unless a big manufacturer decides to take a risk and create a market by mass producing them and selling them at competitive prices. EAROMs (electrically alterable ROMs) are more likely to succeed, once they can be produced in large enough quantities in versions which require a lot less power than existing ones, have a higher bit density and work on a single 5 volt power supply. This leaves us with conventional magnetic disks, a far from ideal medium because the drives use a lot of power and disks are rather fragile. The best current compromise is the 3in or 3½in microfloppy. At least the disks are small and protected by a sealed, rigid envelope. Forget about making the machine IBM-compatible — the Americans, like a flock of sheep, have jumped onto the IBM bandwagon with a vengeance and currently seem incapable of thinking about anything else. But by the time technology has advanced to make possible the sort of portable machine which I am describing, the IBM compat-

ibility craze will have largely died down and become irrelevant.

This brings us to processors and other considerations. It's scarcely worth building an 8-bit machine, except to sell it at a *really* low price — well under \$1500 including screen, twin disks and software. Because we want a battery-operated machine, we need CMOS chips, which use very little power. A CMOS version of the 8086 16-bit chip has recently been announced so that problem is solved — our true portable will be based on this chip and will have *at least* 256 bytes of CMOS RAM. Ignore the display for the moment, such a machine would be incredibly expensive to build today, but every chip manufacturer worth his silicon is getting deeply involved in CMOS technology and by the time we have our big LCD display these chips will be pretty cheap.

Physically, there is a limit to how small you can make a portable machine. This is imposed by the keyboard, which must be of typewriter size and pitch. The Epson HX-20 or Tandy 100 size is probably about the minimum practical. Add a little height to squeeze in the microfloppy drives (under the keyboard with the doors at the front, perhaps) and put a lid with the LCD display inside and there you have it — a machine occupying the same desk areas as an A4 sheet of paper, with a total height when closed of three or four inches, totally self-contained except, maybe, for a battery charger unit, and weighing at most maybe 2 or 3 kilos. I don't think this is at all fanciful but we may have to wait for a couple of years before we can buy it; and when it does appear, we shouldn't have to pay more than \$1200 for it — with software, which should include a word processor, a diary/appointments manager, a database system of some sort, electronic mail capabilities (probably using a built-in modem), the inevitable spreadsheet and Basic.

In the meantime, if you want a cheap computer you can buy an Osborne or Attache or one of the other low-cost 8-bit machines now appearing. If you want a serious, non-portable, rugged machine capable of handling the hammering of daily business use, spend more money for a proper desk-top machine. And if you want a portable, take weight-lifting classes first and don't expect to be able to use it if you're more than two metres away from the nearest power socket.

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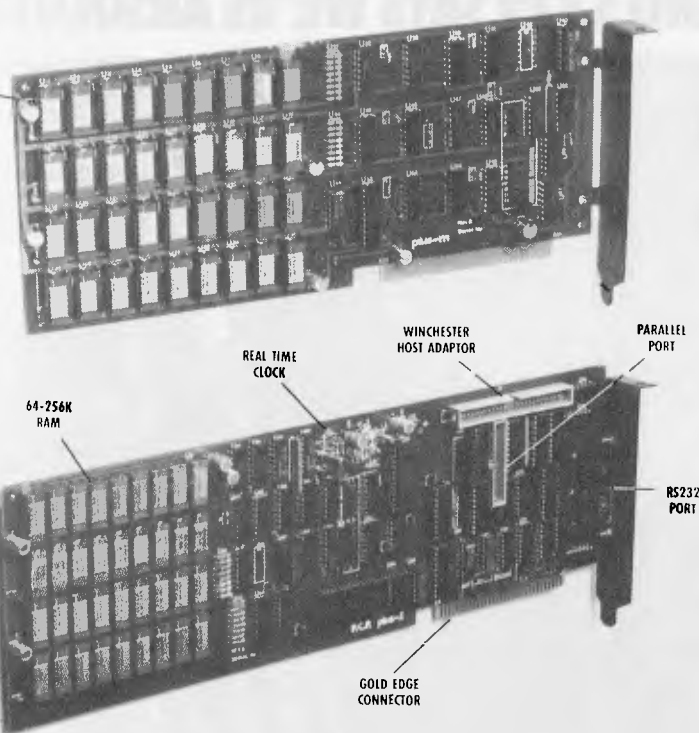
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TI IN MOTION

Adrian Bicker looks at some of the intricacies of TI Extended Basic and presents a few programs.

'TI Extended Basic is known for its sprites. These move over a 256 dot square grid, the bottom quarter of which is not visible on the screen.' That is what the manual says but it is not the case.

The first clue to the actual situation is the behaviour of a sprite moving across the screen at 45 degrees. If the grid were square, it would follow the same path each time it passed across the screen. In fact, the sprite steps across the screen each time, taking eight passes to revert to its original path. This shows that the grid is rectangular, with the lengths of the edges in the ratio of seven to eight. From this it seems that there are only 224 dots down the screen.

This is strange as the sprite sub-program accepts dot-row values from one to 256. The following program shows how this range of values is treated:-

```
100 CALL MAGNIFY (4)
110 CALL CLEAR
120 CALL CHAR (40, RPT$( "F", 64))
130 R, P = 1
140 PRINT :: DISPLAY AT (21,1):
R;P;R
150 ACCEPT AT (22,2) SIZE (-3):R
160 CALL SPRITE (#1,40,13,R,
200,0,0)
170 CALL POSITION (#1,P,C)
180 GOTO 140.
```

The program accepts a row number and positions the large square sprite accordingly. The sprite's actual row number is then displayed for comparison against the original figure.

Entering row numbers from 195 to 226 gives varying results. For any of these values, the sprite is positioned at a row which is either 32 greater or 32 less than the row number selected. This shift appears to be random as can be seen if the same row number is entered repeatedly.

A significant point is that if you 'hide' a sprite off the bottom of the screen by using a row number of 192 or more you may be in for a surprise. If you used row 200 for instance, the sprite sometimes appears at row 168 which is actually visible on the screen!

This positioning problem only occurs if the sprite has a velocity specified in the SPRITE or MOTION sub-programs, even if the velocities are zero as above.

Getting back to the problem of the dimensions of the grid, the changing of the row numbers by plus or minus 32 for rows 195 to 226 results in rows 195 to 226 never being used.

This is consistent with the grid having only 224 dot rows. These would be

numbered 1 to 194 followed by 227 to 256. This can be confirmed by running the program below which repeatedly prints the row of a sprite which is moving slowly down the screen.

```
100 CALL SPRITE (#1,43,13,1,
200,2,0)
110 CALL POSITION (#1, R,C)
120 PRINT R
130 FOR I = 1 TO 80 :: NEXT I :: GOTO
110
```

Understanding the strange arrangement of the row numbers is important for anyone who intends to use sprites seriously. There are two main ways in which it affects the planning of a program.

If you wish to have a regular sequence of sprites moving up or down the screen, their initial row numbers will have to be evenly spaced. In calculating these positions, remember that there are really only 224 rows not 256. Also, remember that the distance between rows 194 and 227 is one not 33!

A more insidious problem is overcoming the most significant limitation of TI sprites. This limitation is that you can use no more than four sprites across any row of the screen. More than this and the sprite with the highest number blanks out.

You can control this to some extent by careful planning of the positions and relative motions of the different sprites. With vertical motion, some sprites may have to start off the bottom of the screen. If so, avoid referring to rows 195 to 226 since the 32 row shift can play havoc with the careful planning and even worse, the fault is intermittent due to the random nature of the shift.

TI-99 joystick emulation

Joysticks are often the easiest way to control movement on the screen and they are frequently used in games programs. If you are still saving for your joysticks and want to convert a program to respond to the keyboard instead, the following routine should solve your problem:-

```
100 REM SET UP
110 N = 0
120 FOR I = -1 TO 1
130 FOR J = -1 TO 1
140 N = N + 1
150 JY (N) = I * 4
160 JX (N) = J * 4
170 NEXT J
```

```
180 NEXT I
1000 REM SUBROUTINE
1010 CALL KEY (0, I, J)
1020 I = I - 50 * (I < 0)
1030 P = POS ("ZXCS#DWER",
CHR$(I),1)
1040 X = JX(P)
1050 Y = JY(P)
1060 RETURN
```

The set up section needs to be put at the start of the program as it sets all the necessary values.

Use GOSUB 1010 as a direct substitution for the CALL JOYST statement in the program to be converted. Note that the X and Y in lines 1040 and 1050 will have to be changed to correspond with the variable names used in the original JOYST call.

As it stands, the subroutine will sense the eight directions of a joystick using keys W,E,R,S,D,Z,X and C as you might guess from line 1030. This can be restricted if necessary to respond to only four directions by substituting '#X#S#D#E' in that line.

In some circumstances, there is no advantage in the subroutine repeatedly returning nil values as an unpressed joystick would. This can be avoided, decreasing the initial response time by changing line 1020:-

```
1020 IF J = 0 THEN 1010
```

Similarly, if it is preferable to press a key repeatedly rather than have auto repeat, line 1020 could be changed to:-

```
1020 IF J < 1 THEN 1010
```

There is one other problem you could have in converting a joystick program. What do you do if you are expected to press the action button? The answer is simple. Press either Q or Y according to whether joystick one or two is meant to be in use. Do not press Q and shift on the old TI-99/4s or you will quit Basic!

Try converting the following short program:-

```
200 CALL CLEAR
210 CALL COLOR (2,7,7)
220 CALL COLOR (3,13,13)
230 CALL HCHAR (24,1,40,64)
240 CALL VCHAR (1,32,40,48)
250 PY = 12
260 PX = 16
270 CALL HCHAR (PY,PX,48)
280 CALL JOYST (1,X,Y)
290 TY = PY - Y/4
300 TX = PX + X/4
310 CALL GCHAR (TY,TX,R)
320 IF R = 40 THEN 280
330 PY = TY
```



```
340 PX = TX
350 GOTO 270
```

As it is written, the subroutine can be used in TI Basic or Extended Basic on the TI-99/4 or on the TI-99/4A using the shift or alpha lock key to get the upper case letters. To make the program sensitive to lower case, just substitute small letters in line 1030.

Character redefinition

When redefining numerous blocks of characters in TI Extended Basic, it is frequently necessary to include long strings of '0's. The available RPT\$ function is cumbersome to use too frequently. A neater approach is to define a string as follows:-

```
DEF Z$(X) = RPT$("0",X)
```

Z\$() can then be included in the character code string. For example:-
CALL CHAR (96,Z\$(15)&"101" &
Z\$(28) & "808")

The same technique can be used in TI standard Basic by changing the definition of Z\$(). Make sure that you put in enough zeros for your requirements.

```
DEF Z$ (X) = SEGS("00000000  
0000000",1,X)
```

TI Display

One of the problems encountered with the standard TI-99/4A Basic is that there are no cursor control commands so that a PRINT statement invariably results in screen scrolling. This is often inconvenient especially when a screen layout has been produced for game playing.

The only way to overcome the problem is to position each character on the screen in turn using the HCHAR or VCHAR subprograms. The following subroutine can be used to print any string or number on the screen without screen scrolling:-

```
500 CALL HCHAR (R,C,32,L)
510 FOR I = 1 TO LEN(W$)
520 CALL HCHAR (R,C+I-1, ASC  
(SEG$(W$,I,1)))
530 NEXT I
540 RETURN
```

Before the subroutine is used, the row and column numbers R and C must be set and W\$ must be assigned the string to be printed. If a number is to be printed assign STR\$(number).

Line 500 overcomes the remaining problem that if a short word overwrites a longer one, the end of the longer word remains on the screen. It blanks out a portion of the row starting at column C. Set L to equal the number of blanks required.

If this feature is not required, use GOSUB 510.

Add the following lines and try running the test program.

```
100 CALL CLEAR
110 W$ = "TEXAS"
120 R = 4
130 L = 7
140 FOR C = 20 TO 8 STEP -2
150 GOSUB 500
160 NEXT C
170 FOR J = 1 TO 5
180 READ R,C,W$
190 GOSUB 510
200 NEXT J
210 GOTO 210
220 DATA 4,14,INSTRUMENTS
230 DATA 18,14,BASIC
240 DATA 12,11,TI BASIC OR
250 DATA 15,13,EXTENDED
260 DATA 7,7,THIS PROGRAM RUNS  
IN
```

If you prefer your words to be printed vertically on the screen just use VCHAR in line 500 and change the expressions in 520 to R+I-1 and C.

This approach to displaying information on the screen has another advantage over using the PRINT statement as it enables you to use the full 32 columns rather than the usual 28.

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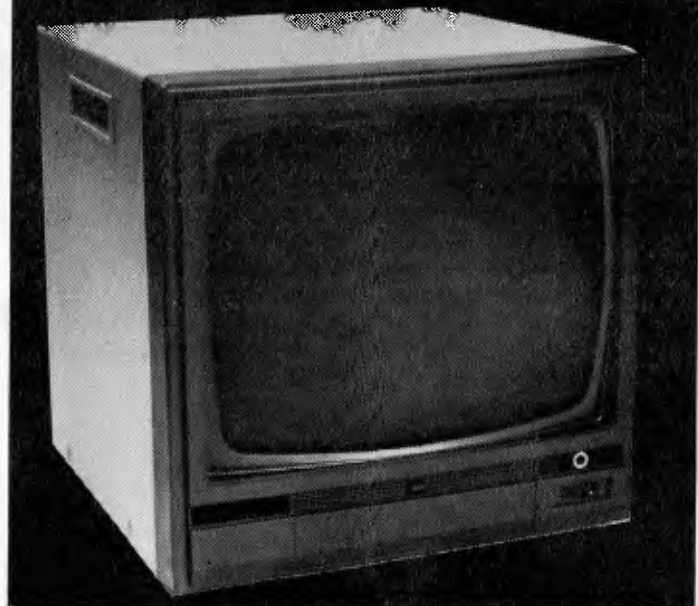
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This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in APC. While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. Well, in the words of *The Hitch-hikers' Guide to the Galaxy*, don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed'. This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of APC.

For those completely new to computing, let's start with the question: what is a microcomputer? We can think of a micro as a general-purpose device as opposed to a typewriter which can only be used for typing, a calculator to perform calculations, a filing-cabinet to file information and so on. A micro can do all those things and more.

If it is to be of any use, a general-purpose device needs some way of having a function assigned to it. We do this by giving the computer a set of logical instructions called a **program**. The general term for computer programs is **software**. Every other part of a microcomputer system is known as **hardware**. 'If you can touch it, it's hardware.'

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a code known as a **computer language**. There are literally hundreds of different languages around, the most popular of these being **Basic**. Basic is an acronym of **Beginners' All-purpose Symbolic Instruction Code**. Although originally intended only as a simple introductory language, Basic is now a powerful and widely-used language in its own right.

Other languages you're likely to come across in APC include **Forth**, **Pascal**, **C** and **Comal**. These are known as **high-level languages** because they approach the sophistication of a human language. You'll also see references to the low-level languages, **assembly language** and **machine code**. We'll look at high and low-level languages in a moment.

The heart of a micro, the workhorse, is the **processor** or **Central Processing Unit (CPU)**. The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor around, the **Z80**, **6502** and **8088** being the three most common. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

Being electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by **binary** (base two) notation, the two binary digits (known as 'bits') being 0 and 1. It is possible to program computers in binary notation, otherwise known as **machine code** (or machine language) programming.

Machine code is called a low-level language because it operates at a level close to that 'understood' by the processor. (Languages like Basic are known as high-level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.)

Between high-level languages and machine code is a low-level language known as **assembly language** or, colloquially, **assembler**. This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since there is no binary equivalent of a comma or the letter 'a', for example, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the **American Standard Code for Information Interchange, ASCII**. This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

There are two types of program to do this translation for us. The first of these is a **compiler** which translates our whole program permanently into machine code.

When we compile a program, the original high-level language version is called the **source code** while the compiled copy is called the **object code**. Compiled programs are fast to run but hard to edit. (If we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code.) For this reason there is a second translation program: an **interpreter**. An interpreter waits until we actually run (use) the program, then translates one line at a time into machine code — leaving the program in its original high-level language. This makes it slower to run than a compiled program, but easier to edit.

There are two strange-sounding Basic words you're likely to come across: **POKE** and **PEEK**. When you program in a high-level language, you are normally unable to choose which part of the machine's memory the processor will use to store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the **POKE** command, however, you can 'POKE' a value directly into a desired memory address. 'POKE 1000,56', for example, puts the value 56 into memory location 1000. **PEEK** allows you to examine the content of a particular memory address. If you were to follow the above **POKE** with 'PEEK 1000', the computer would respond by displaying the value 56. (**POKEing** and **PEEKing** is normally done to increase program speed. It's a compromise between Basic and machine code.)

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of memory. There are two types of memory known as **Read Only Memory (ROM)** and the badly-named **Random Access Memory (RAM)**. **ROM** is so-called because the processor can 'read' (get things out of) its contents, but is unable to 'write to' (put things in) it.

ROM is used to store **firmware**, which consists of software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from **ROM** in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and data (information). The second important difference is that **RAM** needs a constant power-supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8-bit binary number. 8 bits make one byte and 1024 bytes make one **kilobyte** or **1k**. 32k, for example means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16... 1024 being the nearest binary multiple to 1000.

There are numerous forms of **permanent** or **backup** storage, but by far the most common are the **floppy disk** and **cassette**.

Floppy disks or **diskettes** are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a **disk drive**. Disk drives comprise a high-speed motor to rotate the disk and a read/write head to record and 'playback' programs and data.

The disk is divided into concentric rings called **tracks** (similar to the tracks on an LP) which are in turn divided into small blocks by spoke-like divisions called **sectors**.

There are two methods for dividing the disk into sectors. One method is called **hard-sectoring**, where holes punched in the disk mark the sectors, and the other is **soft-sectoring** where the sectors are marked magnetically. (The reason that disks from one machine

can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers do seem to have begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible with each others.)

Since the computer needs some way of tracking the whereabouts of everything on the disk, we have a program called a **Disk Operating System**, more usually known simply as the **Operating System (DOS or OS)**. The operating system does all the 'house-keeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available (each with its own advantages and disadvantages). The two most popular OSs are **CP/M (Control Program for Micros)** and **MS-DOS (Microsoft Disk Operating System)**.

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and is adequate for games and the like.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of programs and data. Hard disk capacity generally starts at around 10 Mbytes (10 million bytes) and rises to... well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Since computers need some way of communicating with the outside world, we need input and output devices. Input and output devices include all manner of things from hard disk units to light-pens, but the minimum requirement for most applications is a typewriter-style **keyboard** for input and a tv-like **Visual Display Unit** for output. The **Visual Display Unit** is variously referred to as a **VDU**, **Cathode Ray Tube (CRT)** and **monitor**.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, etc) may all be built in to a single unit or they may be separate, connected by cables.

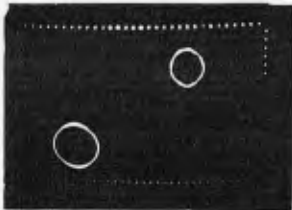
Take this paragraph slowly and it makes sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — **parallel** or **serial**. **Parallel input/output (I/O)** requires a number of parallel wires. Each wire carries one bit, so with 8 wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). **Serial I/O**, in contrast, uses a single wire to transmit a series of bits one at a time with extra bits to mark the beginning and end of each byte.

To enable different devices to communicate with each other in this way, standards have been agreed for different **interfaces**. An interface is simply a piece of circuitry used to connect two or more devices. The most common standard serial interface is the **RS232 (or V24)** while the **Centronics** standard is popular for parallel interfaces.

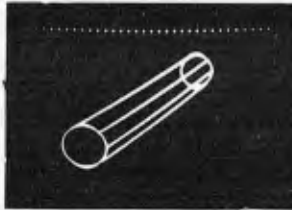
When two computers want to communicate with each other over a distance, there are again two ways of doing it. Both methods use the public phone network. The simplest and cheapest method is to use a device known as an **acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. However an acoustic coupler is slow and not exceptionally reliable.

A more sophisticated (and correspondingly more expensive) method is to use a **modem**. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from Telecom.

So, now you know!



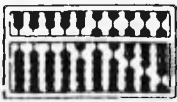
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Personal Basic talks your language

Max Phillips asks whether Digital Research's Personal Basic is a dream interpreter.

It's not every day you meet a brand new shiny Basic. And when you do, you can expect to spend weeks delving into its weird, wonderful and frequently murky depths.

But not with the new \$250 Personal Basic from Digital Research. Personal Basic is an interpreter for CP/M-86 systems, and you'd find it hard to tell from Microsoft Basic if you met it on a dark night.

It might seem odd to launch a new Basic that's more or less the same as the old Basic. The story begins long, long ago, in a galaxy far away . . . Digital Research used to supply operating systems (CP/M) and Microsoft had the Basic to go with it.

More recently, there's been a little strife between the two companies and their 16-

bit operating systems, CP/M-86 and MSDOS. At some point during this fabled clash Microsoft quietly withdrew support for its basic under CP/M-86.

In terms of the story, Microsoft just pulled out the rug from under its rivals. Even now, people still feel the need for Basic. The answer had to be a new supported CP/M-86 interpreter. One that wouldn't alienate the hundreds of programmers who grew up on Microsoft. The answer had to be Personal Basic.

Features

PB (must we call it that?) is the equivalent of Microsoft's standard Basic 86 or MBasic. It's written in BCPL, and ran with around 43k of free memory on the review IBM PC. Apart from a few

oddments, the only major additions are a range of unusual debugging tools.

Personal Basic will do tricks like single stepping programs, on-entry syntax checking and so on. The emphasis is not on program performance but on program development.

And the emphasis is in the right place. Personal Basic is for the casual programmer and novice. DRI has CBasic as its 'professional' tool. So PB should be easy to learn and easy to use. It is . . . to an extent, but the opportunity to go the whole hog and provide masses of disk-based development utilities — global editors, cross referencers and so on — has been missed.

Personal Basic doesn't have support for modern developments such as graphics, sound and keyboards with

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function keys on them, so there's a horrible feeling of working with a powerful and expensive machine with your hands tied behind your back.

But you can get around this, just like people do with Basic 86. You have OS configure routines that set character sets and keyboard definitions, BLOADED graphics support and fancy BIOSes with lots of PRINT CHR\$. Thanks a million.

What people need these days is a Basic that supports the hardware it's running on, like Microsoft's GWBasic, developed

for the IBM, does. GW supports sound, graphics, communications, joysticks and so on and so on.

Personal Basic has none of these — not yet. So meet Son of Personal Basic. PB2 is a new version of the interpreter scheduled for November. It will provide compatibility with GWBasic under the Digital Research GSX graphics standard, but though it may be right, it is also going to be late.

The review copy was minus its packaging, but the format will be the

usual DRI A4 plus binder manuals — and hopefully a nice, shiny box.

```

Ok old demo
Ok list
List of DEMO.BAS

10 i=1
20 print i
30 i=i+1
40 goto 20

Ok break 30
Ok run
1
b 30 i=i+1
Br step
s 40 goto 20
Br
s 20 print i
Br
2
s 30 i=i+1
Br end
Ok edit 40
40 goto 20
Ed iif i<11 then
40 if i<11 then goto 20
Ed
Ok replace
Ok
  
```

A sample session with Personal Basic showing some of its unusual debugging aids and its not-so-nice line editor.

Documentation

PB scores in documentation, and not just for its standard and complete reference manual modelled closely on Microsoft's documentation. PB comes with a tutorial, and this is a vital part of any basic interpreter and a dreadful omission from Microsoft's stuff.

The tutorial is spot on. It's not the kind of patronising kiddy thing you get with a home computer, but a straightforward and sensible text. It's ideal for the sort of serious newcomer who might meet PB.

My only quibble is that it stops short, with more complex topics being run over into the reference manual. Fortunately, the reference work is in the same easy-going style as the tutorial, and DRI has not fallen into the trap of having a gap between tutorial and reference works big enough to swallow users whole.

Getting started

Booting Basic couldn't be simpler, as because Personal Basic has no machine dependence, it doesn't need to be installed. You just type BASIC and hit return.

There doesn't appear to be any of the magic command line options you can use when starting Microsoft Basic. This is good in parts, as you don't have to reserve space for random file buffers bigger than 128 bytes (/S: under Microsoft). PB can do all this dynamically, up to a 4k record buffer.

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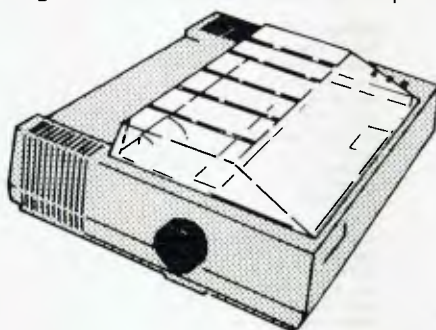
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Unfortunately, you can't include a program name on the command line and get Basic to load and autostart the program for you, and experiments with SUBMIT failed to fudge this. It's a serious drawback wherever there are normal people trying to use your programs.

In use

If you've used Microsoft Basic, it won't take long to adapt. Features and performances are both closely matched, the important differences are for development.

PB names its programs — you can include a file name after NEW and PB will remember it. It appears on LISTings and you can type just SAVE to save your program. SAVE won't overwrite an existing file, but you've got REPLACE, and this will. Typing REPLACE every ten minutes or so is an easily picked up and healthy habit.

Programs are loaded from disk using OLD rather than LOAD. Quite why this arcane word has re-emerged is unclear. Most of tomorrow's Basic programmers will associate OLD with recovering NEWd programs.

As you enter lines, PB checks them for syntax. You get the polite 'Something is

wrong' message plus a helpful omission mark under the offending characters if you make a mistake.

But even if the line is wrong, PB accepts it. When you LIST the program, offensive lines have a question mark beside them. This unique and apparently strange feature is a lot better than it first seems. You can give a listing to a non-programmer, and say, 'type that in'. The typist can bash in the program, ready for the programmer to come back, LISTit, and correct any errors.

Debugging is great fun under Personal Basic. TRON and TROFF provide the usual line number trace, and you've also got TRACE and UNTRACE, which lists the line to be executed as well as its number. These two can be selective. If you specify a list of line numbers with the commands, only those lines count in the trace. To avoid confusion, lines which are selected for tracing are flagged with a 't' in LISTings.

FOLLOW and UNFOLLOW (Yuk!) print out variables and their values whenever they change. Programs are interrupted with Control-C, but this doesn't return you to Basic's command level. Instead, you land in 'break mode' prompted by Br. The other way into break mode is to use the helpful BREAK and UNBREAK (Double yuk!) BREAK lets you specify break-points at certain

lines in the program. Breakpoints are flagged in LISTings with a 'b'.

What can you do in BREAK mode? Anything you like. Most of the commands you'd want to use while debugging work as normal. You can list bits of program, print variables, fiddle their contents and so on.

CONT resumes execution of the program. STEP lists and executes the next line. Even aged Basic hacks will have fun with this. If the program hangs, you can hit Control-C and then STEP round the offending loop. But newcomers who learn on Personal Basic will have problems working with lesser things.

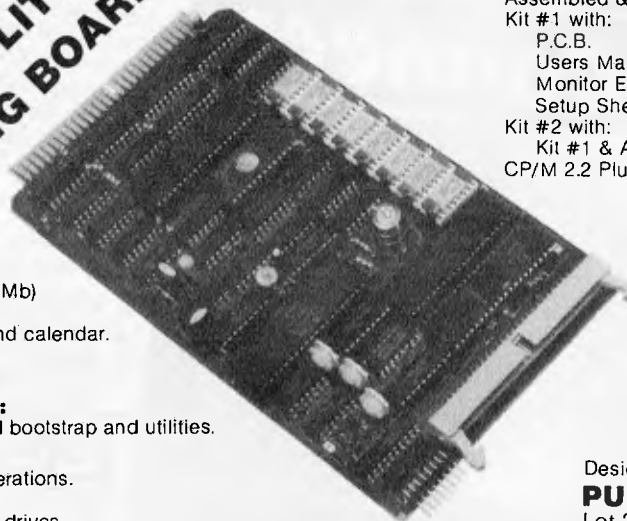
Talking of lesser things, there's the line editor, and this is the weak link amid all these wonderful new tools. It's one of those horrible nasty old serial-based line editors, and not a good one either. You get into it with EDIT, or by pressing Escape if you want to edit the current line. It's also worth complaining that you can't automatically retype the last command. The line editor prompts with Ed (not a reassuring choice) and lists the line to be edited with the cursor below it. You space along the line, blindly wreaking havoc with a set of Microsoft style single letter commands.

Behaviour is unusual. To insert, you type 'I' followed by the characters to

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Sendata 300 Modem Direct Connect

A new direct connect 300 bps modem that is no taller than a 50c piece and fits snugly under the base of a telephone, has been released by Australian communications manufacturer, Electromed. Called the Sendata 300 the modem is simple to operate and does not require operator training. It attaches to the existing telephone wall socket plug and becomes fully operational with the flick of a switch by the operator.

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insert and a return. But be warned — I inserts before the character above it, not after it as on almost all similar editors. Typing X return leaps onto the end of the line being edited rather like X under Microsoft's editor. And you can't edit line numbers in order to copy lines. Curiouser and curiouser.

There is an excuse for having a serial editor. But it's not a good one. Obviously, if you are working with a teletype for a terminal (teletype: elderly VDU with paper where the glass should be) you can't provide fancy on-screen editing.

But of course, more than 90 per cent of CP/M-86 users have screens — usually with fancy graphics. And there's no reason why there shouldn't be two editors, either as a switch in the Basic source for different machines or simply two commands in the finished product.

PB also won't let you have lines longer than one screen-line unless you personally put in the Line-feed. And one last moan... RENUM uses a disk file as a scratch pad. It's very unusual for a renumber to need this. I wouldn't mind, but PB forgets to delete the file (BASK/WRK) afterwards.

Error messages are remarkably clear and helpful. But 'you cannot divide by 0' should be fatal. PB prints a warning, and continues happily with the program. It's a dangerous (if not fatal) error on the part of the designers.

There are a few extras in the language LOG 10(X) is a quick way of writing LOG(X)/LOG(10). FLOAT converts an integer into a single precision number. There are a few extras in the language. The OS commands DIR and ERA are available from Basic. ERA erases files even though the Microsoft equivalent of KILL is also there.

DIR is a sore point. Microsoft Basic uses FILES — a command not present in Personal Basic — to list the directory. It's possible to use FILES A\$ MBasic to list files which fit the file specification in A\$. Under PB, DIR A\$ searches the directory for a file called A\$, so there could be conversion problems here.

The only other point that might cause trouble is that there are differences in the floating point accuracy. Programs which rely on maths may give different results. But then it is the programmer's fault if he or she is careless enough not to be wary of floating point maths. Beyond that Personal Basic is everything you heard it would be. A 16k Microsoft Basic.

Verdict

Personal Basic is a real success, and newcomers and casual programmers will enjoy its extended development aids and friendly documentation. But it's a shame that we'll have to wait for graphics

support and a real pity that the line editor is a mess.

Personal Basic fills a hole now... a

cared-for Basic under CP/M-86. Hopefully, come November, the shortcomings will be removed.

HOW PERSONAL BASIC COMPARES

Test	Personal Basic/CP/M-86	IBM Basic/PC-DOS
Sort	17.6 secs	21 secs
Maths	52.6 secs	45 secs
Disk	6 mins 6 secs	3 mins 58 secs

We benchmarked Personal Basic against its most obvious rival. We ran PB under CP/M-86 on an IBM PC and compared it with IBM Basic under PC-DOS.

The tests were three short Basic programs, a sort of 50 numbers, repeated evaluation of a complex mathematical formula and a disk test. This last program creates a 250k data file and then re-orders the records within it.

Remember that the maths benchmark does not take account of accuracy. Although PB and IBM Basic work to superficially the same accuracy, the actual accuracy of the calculations may be different.

Personal basic line editor commands

A	Ignore changes and restart edit
[n]C	Replace n characters with characters following C
[n]D	Delete characters
E	End edit. Same as 'return'
Escape	End insert
H	Delete from cursor to next line feed then enter insert mode
I	Insert the characters following I
K	Delete characters up to the character following K
L	Cursor to left of line
Q	Quit edit without changes
R	Cursor to end of line
S	Moves cursor to next occurrence of character following S
X	Moves cursor to end of line and enters insert mode

Personal Basic extensions

BREAK DIR ERA FLOAT FOLLOW LOG10 OLD
REPLACE STEP TRACE TRON TROFF
UNBREAK UNFOLLOW UNTRACE



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DATALINE is a new, Australian designed and produced communications system which drives Modern Technology's UDM — 1200 Modem and Novation Cat in the popular U.C.S.D. Pascal Environment and gives the user a wide range of capabilities for communication with databases and other computers. The range of functions provided by DATALINE include . . .

AUTO-DIAL: Numbers can be fetched automatically from DATALINE's Phone Directory and dialled by the system. All you need remember is the name of the person you wish to ring.

FILE-HANDLING: Pascal files can be sent and received onto a disk and/or printer. All incoming and outgoing information can be shown on the screen so that it can be checked.

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CONTACT: Mike/George — Sales

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COMMAND FILE SYSTEM: This allows you to create a file of DATALINE functions which will subsequently be executed simply by typing in the name of the Command File. Any number of such files can be created. Apart from making the system easier for you to use they also enable it to be operated in your absence (e.g. by an inexperienced user or automatically in conjunction with a clock).

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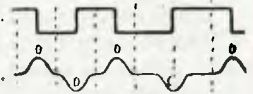
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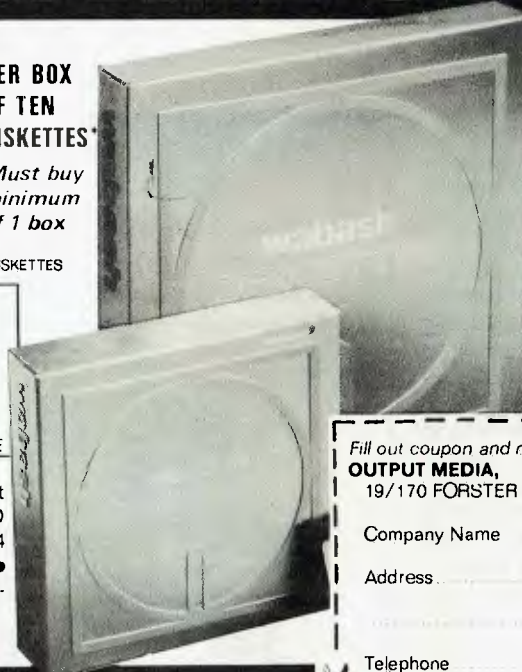
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NUMBERS COUNT

THE PARTITIONS OF A POSITIVE INTEGER

More of Mike Mudge's mathematical problems.



Background

(i) Congruences: Given three integers a , b and c we say that a is congruent to b modulo c and write $a \equiv b \pmod{c}$ if and only if $a - b$ is an integer multiple of c . Thus: $15 \equiv 1 \pmod{7}$ because $15 - 1 = 14 = 7 \times 2$.

(ii) Partitions: A partition of a positive integer, n , is a non-increasing sequence of positive integers whose sum is n . $p(n)$ denotes the number of partitions of n . Thus: $p(4) = 5$ because $4 = 4$, $4 = 3 + 1$, $4 = 2 + 2$, $4 = 2 + 1 + 1$, $4 = 1 + 1 + 1 + 1$.

Problem

(a) (i) Calculate, as efficiently as possible, $p(n)$, the number of partitions of a given n , verifying, if possible, the following results: $p(10) = 42$, $p(20) = 627$, $p(50) = 204226$, $p(100) = 190569292$.

(a) (ii) Factorise the calculated $p(n)$ into prime factors.

(b) Verify the following observations of S Ramanujan:

(i) $p(4), p(9), p(14), p(19), \dots$
 $\equiv 0 \pmod{5}$

(ii) $p(5), p(12), p(19), p(26), \dots$
 $\equiv 0 \pmod{7}$

(iii) $p(6), p(17), p(28), p(39), \dots$
 $\equiv 0 \pmod{11}$

(iv) $p(24), p(49), p(74), p(99), \dots$
 $\equiv 0 \pmod{25}$

(v) $p(19), p(54), p(89), p(124), \dots$
 $\equiv 0 \pmod{35}$

(vi) $p(47), p(96), p(145), p(194), \dots$
 $\equiv 0 \pmod{49}$

(vii) $p(39), p(94), p(149), \dots$
 $\equiv 0 \pmod{55}$

(viii) $p(61), p(138), \dots$
 $\equiv 0 \pmod{77}$

(ix) $p(116), \dots$
 $\equiv 0 \pmod{121}$

(x) $p(99), \dots$
 $\equiv 0 \pmod{125}$

Now in 1919, S Ramanujan made the following remarkable conjecture, based upon empirical evidence, including the above results: 'If $d = 5^a 7^b 11^c$ and $24k \equiv 1 \pmod{d}$, then:

$p(k), p(k+d), p(k+2d), \dots \equiv 0 \pmod{d}$. This theorem is supported by all the available evidence, but I have not yet been able to find a general proof.'

Now c1930 S Chowla found a counter example to the Ramanujan conjecture; $p(243) = 133978259344888 \not\equiv 0 \pmod{7^3}$ however $24 \times 243 \equiv 1 \pmod{7^3}$

Note: A fully modified conjecture was proved in 1967 by A O L Atkin; viz. If $d = 5^a 7^b 11^c$ and $24k \equiv 1 \pmod{d}$, then:

$p(k) \equiv 0 \pmod{5^a 7^{b+(b+c)/2} 11^c}$ where $[X]$ denotes the greatest integer not greater than X . We make no attempt to explore this brilliant result on this visit to the theory of partitions.

(c) Find other counter examples to the Ramanujan conjecture as quoted above.

Submit a program, or suite of programs, which tabulate $p(n)$ as a function of n , together with its prime factors (and appropriate multiplicities). Interpret these within the context of the Ramanujan conjecture. All submissions should in-

clude program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order).

Entries, to arrive by 15 November, to: Mr M R Mudge, C/- APC, P.O. Box 298, Clayton, Vic 3168.

Note: Submissions will only be returned if a suitable stamped addressed envelope is included.

Review — May 1983

There was complete agreement on the solution sets of the Triangular, Tetrahedral and Fibonacci Numbers introduced in May.

- a) {1,10,120,1540,7140}
- b) {1,3,21,55}
- c) {1,8,13}

The completeness of the solution set for Problem a) has been established theoretically: AVANE SOU.B., ACTA. ARITH., 12, 1967 pp 409-419.

There is, however, no such result for either b) or c) known to the present author; indeed some mathematicians have expressed an intuitive feeling that these have infinite solution sets in spite of the empirical evidence.

The competition was very close this month, the 'best' entry was ultimately considered to be that generated in Basic using an Epson HX-20 by Paul Fierens to whom a suitable prize will be sent.

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BENCHTEST

ARCHIVES P.C.

The Canadian-designed Archives P.C. is yet another addition to the ever growing list of 64k, Z80, CP/M based computers. However, this did not deter Dick Pountain . . .



The recurrent nightmare among Bench-testers is that they will be asked to review a 64k, Z80, CP/M computer; the reason is that there is almost nothing left to say about such machines that hasn't already been said one hundred times before. This is a consequence of achieving Industry Standard status. Such machines are now so standard that virtually the only points of differentiation between them are a few terminal control codes which the user never even sees unless a new program needs to be installed; with the growing tendency to 'bundle' a set of major programs such as a word processor, a file manager and a spreadsheet, even this is an unlikely event.

Having said all this I should explain that I actually volunteered to test the Archives P.C., which is precisely a 64k, Z80, CP/M computer. My reason was that it looks as if it offers a very high degree of portability at a low price. The marketplace in portable CP/M based computers has become very complicated in recent months and it is by no means easy to decide which is the best buy, when all the discounted prices and bundled software are taken into account. APC Benchtests are intended, in the last analysis, to aid potential purchasers to make a decision, rather than to always reflect the 'state-of-the-art' in hardware design. There is still an awful lot of utility left in the 8-bit microcomputer, particularly one which runs CP/M-80. This review is being typed, under WordStar, on an 8-bit machine, and I see little possibility of this changing in the near future; at the last count I had ten different language compilers or interpreters in regular use, many of which will not be available on 16-bit machines for some time and most of which will only be able to make use of 64k when they are.

There is still a lot of room for CP/M-80 machines to become smaller, cheaper and to offer more disk storage space for the money, hence my interest in the Archives P.C.

It was designed in Canada by Semi-Tech Microelectronics Corporation of Toronto, manufactured on its behalf in Hong Kong and is being launched in Australia this month by Archives.

Hardware

The basic Archives P.C. consists of a console containing the computer, keyboard and a single disk-drive. There is no built-in display device; the machine must be connected to a separate b/w monitor, or to a domestic TV set via an optional UHF modulator. I was not supplied with this unit and so the review was carried out entirely on a green-screen monitor.

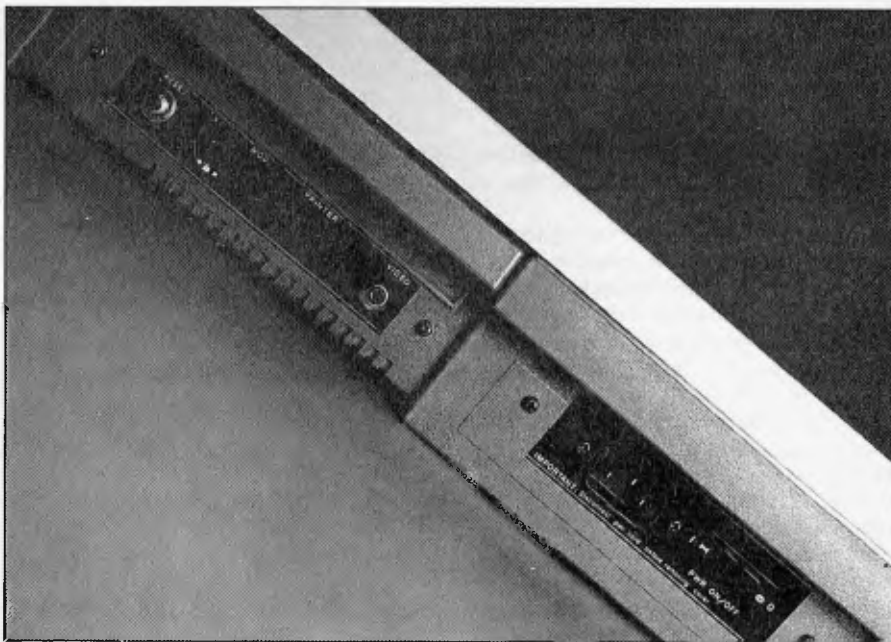
The original Canadian and US models included the option of an Epson two line by 80 character LCD display (similar to that on the Sord M23P). Archives, however, will not be offering this device as they feel it's too expensive and of limited appeal.

The case is a two piece moulding in ABS and is unusual in that the disk drive is housed in a bulge at the right hand end, in line with the keyboard. The keyboard thus sits in a wedge shaped depression which is covered by a removable rigid plastic lid for transportation. A retractable carrying handle is located at the back of the case. At 4 x 20.2 x 10.8 in it is

very compact indeed and it weighs a mere 15lbs. When in its fitted nylon carrying case it feels more like a small portable typewriter than an electric sewing machine (like its major competitors). This carrying case is a smart 'sports bag' type with a zip closure and a separate pocket on the front to hold

leads; it's padded with foam.

Opening up the case, by removing six screws, reveals a mainboard which barely fills two thirds of the case area. This is formed on massively thick fibreglass and looks as if it would shrug off any abuse less than an airplane crash. The board contains the whole computer



The rear panel contains easily accessible sockets.

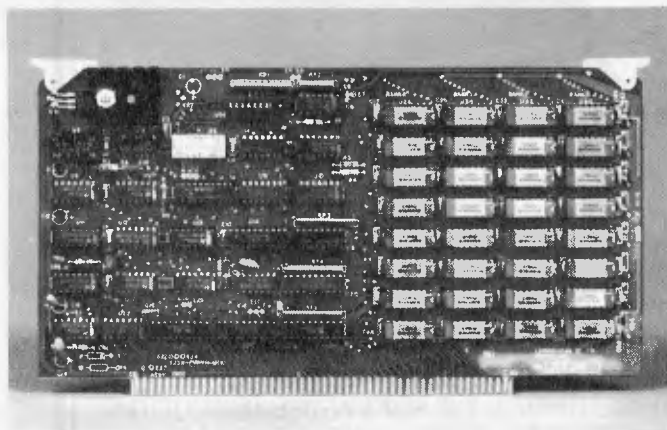
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ARCHIVES P C

apart from the power supply and keyboard. This includes a 4MHz, Z80A processor, 64k main RAM, 4k ROM (bootstrap loader and diagnostics), 2k video RAM and 2k ROM character generator. One feature which is most unusual nowadays is that every chip on the board is socketed which makes for easy replacement. The power supply sits in the empty third of the case and is of the transformerless switching type, rated at 60 watts which is sufficient to run a second disk drive.

A panel at the rear of the case displays a phono type plug for the monitor lead, a Centronics parallel printer socket, a DIN socket for TV-modulator output and the Reset button which performs a cold boot restart. At the left hand corner is the mains power socket and the ON/OFF switch; unfortunately the power lead I was supplied with had an 'L' shaped plug which effectively covered this up and made it difficult to locate. At the right hand corner is a covered slot which opens to reveal an edge connector for the system bus (STD bus compatible) which is used to connect additional disk drives, or for instrument control applications.

The disk drive is the closest that the

Archives P.C. comes to being state-of-the-art. It is a half-height 5¼in unit from Mitsubishi which contains a massive 1 Mbyte unformatted and a gratifying 784 kbytes formatted which makes even the Sirius look inadequate. This capacity is achieved by ordinary double-sided 96 track (40 sectors/track) recording, with no variable speed or other trickery involved and so should prove easy for software producers to emulate on their copying machines. It's fairly quiet in operation and, despite its large capacity, is not noticeably slower than ordinary drives in its access times. Having this sort of space to play with opens up possibilities such as giving two applications their own USER areas on a disk and effectively making it into two disks.

The keyboard is an ASCII standard, full sized typewriter style unit which has all the keys in sensible places. The shift and return keys are double-sized and the space-bar stands on its own. The keys have an excellent light touch with progressive 'feel': one of the nicest I have used and a pleasure to type on. The only ground for criticism is that there are only two cursor keys, with up and down being shifted. There are both backspace and Del keys but in all the programs I tried they did the same thing, a destructive backspace. A key called FUNCT at the lower left hand side performs special

operations when used with a number key. All keys auto repeat after ½ sec.

Above the keyboard are three LEDs which show when the power is on and when either of the disk drives A or B is in operation (B is an external option). Unfortunately the drive A light remained on at all times when the computer was in use, as did the red light on the disk drive, so that little information was conveyed.

When connected to a standard b/w monitor the Archives P.C. produces an 80 character by 24 line display which was both sharp and steady on the Kaga used in this test. Screen updating seemed to be unusually fast though rather messy as a fleeting 'ghost' cursor is to be seen flickering about. The 7 x 5 character set is not particularly pretty with minimal (1 pixel) descenders and a nasty squashed 'i'. Highlighting is supported in the form of high and low intensity characters. Since a TV set will not handle 80 character displays, the Archive P.C. has provided a utility program called TV.COM in their CP/M which switches the display to 40 characters; this condition is retained until you perform the next cold start. When in 40 character mode it's possible to scroll the screen sideways by running the cursor off the edge, or (much quicker) to tab sideways in jumps of 8 or 40 characters using the FUNCT key with 0 7 8 or 9.

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Software

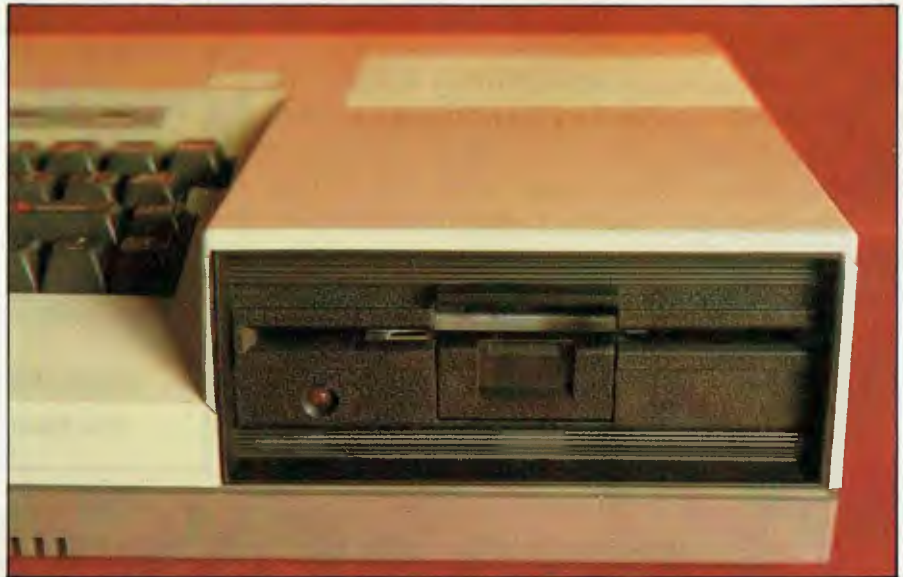
The P.C. comes with a customised CP/M 2.2 and the Perfect Software suite of programs, Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc. With the suite of Perfect series tutorials and application examples over 100 program and data files are provided with the P.C. These are contained on three disks and a blank 'Scratch' disk is included to get you started.

The CP/M has been lightly modified in the interests of easy use. All the intrinsic commands remain the same (DIR,REN,TYPE, etc) but some of the transient utilities are somewhat different from the standard Digital Research versions. FORMAT is replaced by a program called PREPARE which formats, verifies and writes a system onto a disk in one operation. In addition to PIP there is a program called TRANSFER which prompts you to alternatively insert the source and destination disks in order to transfer a file using a single drive. COPY works in the same way to back up a whole disk. It is here that the penalty for using a single 800k drive is paid: copying a diskette requires no less than 20 changes of disk, and for that reason backing up is likely to be done less often than safety dictates. Even transferring a single file can take several changes since only as much as can be held in RAM is transferred at each step. This is exacerbated by the fact that this CP/M is only a 56k system, the top 8k being used

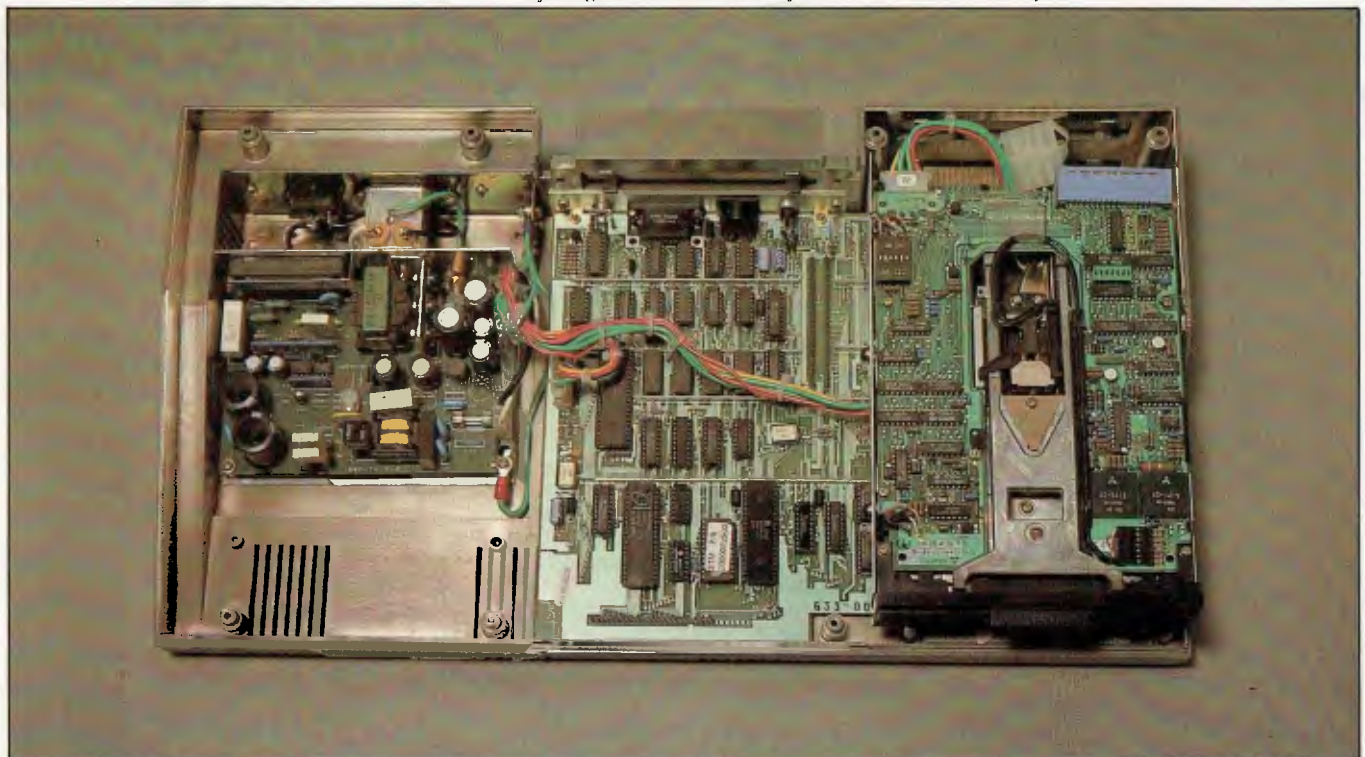
for disk interface, LCD driver and 40 character display routines.

VERIFY is a command, not usually found in CP/M systems, which performs a non-destructive analysis of a disk and reports the number of bad locations found; however, since it provides no way of locking out such sectors, or of recovering data from them, the information is more of morbid interest than utility. One little feature that I liked was the way that Semi-tech has altered the handling of CTRL P so that it tells you if the printer is not ready instead of just hanging up as it does in most CP/M versions.

There is not room here, nor is it appropriate, to review the Perfect suite. Suffice to say that this is a high-class set of programs which has established a good reputation already in the U.S.A. Perfect Writer is one of several word processors based on the mainframe/mini editor EMACS (others include Final Word, Mince and StarEdit). It features separate editing and formatting functions, which while not as immediately attractive as WordStar's 'what-you-see-is-what-you-get' approach, allows for far more complex and sophisticated formatting of documents. It's especially suitable for technical



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reports, manuals, theses and book work, as well as complicated form letters. Its chief drawback is a multiplicity of control and escape codes which make even WordStar look simple. Even though the Archives P.C.'s function key provides over 36 function controls, it lacks dedicated function keys which might have helped here. Definitely one for the more experienced user. Perfect Writer comes equipped with a useful spelling checker called Perfect Speller which, unlike some, will actually type in the corrections for you, and allows roots of unknown words instead of the words themselves to be stored in the dictionary. For example if 'new' is in the dictionary then 'renew' and 'renewed' would be recognised.

Perfect Filer is a reasonably powerful and simple to use database program and Perfect Calc a spreadsheet, both of which use — as far as possible — the same command codes as Perfect Writer so that learning one helps with all. Perfect Calc is supplied with 40 pre-written tutorial and utility sheets, such as one to do Chi-Square analysis in statistics.

Surprisingly the Archives P.C. comes without any high level languages so I was not able to run any benchmark timings; in any case most APC readers will have an idea of what they look like for a 4MHz Z80 by now.

Expansion and potential use

It is my suspicion, yet to be backed by any survey results, that the vast majority of purchasers of Osbornes, Kaypros and the like do not actually do any computing outside of their home or office, and that it was price and free software as much as portability that conditioned their purchase. If this is the case, then the Archives P.C. lack of a built-in monitor is not of much importance. It is possible to keep a monitor at home or the office or both, and to use a TV set if you really do need to compute in a hotel room. The saving in size and weight is really quite significant; it's quite comfortable to take the Archives P.C. on the bus or train or even to strap it on a bicycle carrier.

On the other hand the lack of a second disk drive would quickly drive me potty and I suspect that a second drive will be the first expansion most owners will want to make, after a printer of course. With two drives you are talking about a hefty data-processing system but if this is still not enough, Archives will be able to sell you a 10 Mbyte Seagate winchester by January 1984.

Communications can be catered for by either a dual RS232C board or an RS232C.auto-dial modem board which

Technical specifications

CPU	Z80A (4MHz)
Memory	64k main RAM, 2k video RAM, 6k ROM
Keyboard	ASCII standard, two cursor keys, no numeric pad
Display	One 5in drive (784k formatted)
Disks	Monochrome monitor or TV set
Ports	Centronics parallel, bust extension.
Operating System	CP/M 2.2
Warranty	90 days, parts and labour

fits onto a socket on the main board; Archives is seeking Telecom approval for the latter item and so it will not be available on launch this month.

Documentation

The Archives P.C. User's Manual is a slim 78 page affair which contains instructions on setting up the system and a brief guide to using CP/M with an explanation of the basic commands. You will look in vain for any technical information such as the terminal display control codes, which would be of use to a programmer. The Perfect programs each have their own thick, well written manual and the whole lot, including the Archives manual, fits into a cardboard library case. The documentation is quite adequate for the user who wishes to get going straight away with the applications software but anyone who wishes to write programs will need something more (a language for starters, unless they plan to use ASM).

Conclusions

The Archives P.C. is a solid, workmanlike CP/M computer which has the advantage of being very easily transportable. It also has at least twice as much disk space as most of its competitors, on a single drive. The supplied software is of high quality and covers most of the functions the average user would require. At \$2394 it's good value for money, though remember to cost in a monitor as well. If it were mine, I would want to have the optional second disk drive kept at the place where it will be most used, since without it making frequent backups is unacceptably inconvenient and would probably not get done.

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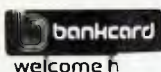
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```

3290 IF ANSWER=BLANK$ GOTO 3270
3300 PRINT
3310 IF ANSWER<>LEFT$(BYE,LEN(ANSWER)) THEN GOTO 3100
3320 PRINT "Bye"
3330 STOP
-----
4010 REM PROCEDURE TO INITIALISE INGREDIENT AVAILABILITY
4020 PRINT "Set up availability of ingredients."
4030 PRINT
4040 FOR I=1 TO NINGRED
4050 PRINT "Do you have any 'INGRED$(I)I', YES or NO "
4060 IF AVAIL(I)=0 THEN PRINT "[N] ; "
4070 IF AVAIL(I)=1 THEN PRINT "[Y] ; "
4080 INPUT ANSWER
4090 IF ANSWER=LEFT$(YES,LEN(ANSWER)) THEN AVAIL(I)=1
4100 IF ANSWER=LEFT$(NO,LEN(ANSWER)) THEN AVAIL(I)=0
4110 REM OTHERWISE NO CHANGE
4120 NEXT I
4130 PRINT
4140 PRINT "Finished. Use INITIALISE or MODIFY to change availability."
4999 GOTO 3200
-----
5010 REM PROCEDURE TO MODIFY INGREDIENT AVAILABILITY
5020 PRINT "Change the availability of ingredients."
5030 PRINT
5040 PRINT "Currently available : "
5050 FLAG=0
5060 FOR I=1 TO NINGRED
5070 IF AVAIL(I)=1 THEN PRINT "  'INGRED$(I)"
5080 IF AVAIL(I)=1 THEN FLAG=1
5090 NEXT I
5100 IF FLAG=0 THEN PRINT " none"
5110 PRINT
5120 PRINT "Change ingredient I : "
5130 INPUT ANSWER
5140 IF ANSWER=BLANK$ THEN GOTO 3200
5150 FOUND=0
5160 FOR I=1 TO NINGRED
5170 IF ANSWER=LEFT$(INGRED$(I),LEN(ANSWER)) THEN FOUND=I
5180 NEXT I
5190 IF FOUND<>0 THEN GOTO 5230 : REM JUMP IF INGREDIENT FOUND
5200 PRINT "Sorry, I can't find an ingredient called 'ANSWER$'."
5210 GOTO 5110
5220 GOTO 5110
5230 AVAIL(FOUND)=1-AVAIL(FOUND) : REM SWITCH AVAILABILITY FLAG
5240 PRINT INGRED$(FOUND) ; " is now "
5250 IF AVAIL(FOUND)=0 THEN PRINT "not available."
5260 IF AVAIL(FOUND)=1 THEN PRINT "available."
5270 GOTO 5110
-----
6010 REM PROCEDURE TO SELECT COCKTAILS
6020 PRINT "List of cocktails that can be made : "
6030 PRINT
6040 GOSUB 11000 : REM FIND OUT WHICH COCKTAILS MAY BE MADE
6050 FLAG=0 : REM COCKTAIL NAME PRINTED FLAG
6060 FOR I=1 TO NRECIP
6070 IF MAKES(I)=0 THEN GOTO 6120
6080 CRECIPE$=RECIP$(I)
6090 GOSUB 10000 : REM DECODE RECIPE STRING
6100 PRINT "  'CNAME$ "
6110 FLAG=1
6120 NEXT I
6130 IF FLAG=0 THEN PRINT " none"
6999 GOTO 3200
-----
7010 REM PROCEDURE TO CHECK USAGE OF AN INGREDIENT
7020 PRINT "Usage of an ingredient in cocktail recipes."
7030 PRINT
7040 PRINT "Check ingredient : "
7050 INPUT ANSWER
7060 IF ANSWER=BLANK$ THEN GOTO 3200
7070 FOUND=0
7080 FOR I=1 TO NINGRED
7090 IF ANSWER=LEFT$(INGRED$(I),LEN(ANSWER)) THEN FOUND=I
7100 NEXT I
7110 PRINT
7120 IF FOUND<>0 THEN GOTO 7150 : REM INGREDIENT FOUND
7130 PRINT "No cocktails contain 'ANSWER$'."
7140 GOTO 3200
7150 PRINT "The following cocktails contain 'INGRED$(FOUND)' : "

```

```

7160 GOSUB 11000 : REM FIND OUT WHICH COCKTAILS MAY BE MADE
7170 FOR I=1 TO NRECIP
7180 CRECIPE$=RECIP$(I)
7190 GOSUB 10000 : REM DECODE RECIPE STRING
7200 FOR J=1 TO CNUM
7210 IF CINGRED(J)<>FOUND THEN GOTO 7250
7220 PRINT "  'CNAME$ "
7230 IF MAKES(I)=1 THEN PRINT "    * ingredients available"
7240 PRINT
7250 NEXT J
7260 NEXT I
7999 GOTO 3200
-----
8010 REM PROCEDURE TO PRINT THE RECIPE OF A COCKTAIL
8020 PRINT "Print a recipe."
8030 PRINT
8040 PRINT "Name of cocktail : "
8050 INPUT ANSWER
8060 IF ANSWER=BLANK$ GOTO 3200
8070 FLAG=0 : REM FLAG FOR A RECIPE PRINTED
8080 PRINT
8090 FOR I=1 TO NRECIP
8100 IF ANSWER<>LEFT$(RECIP$(I),LEN(ANSWER)) THEN GOTO 8210
8110 REM PRINT RECIPE I
8120 CRECIPE$=RECIP$(I)
8130 GOSUB 10000 : REM DECODE RECIPE STRING
8140 PRINT "To make a 'CNAME$' : "
8150 PRINT
8160 FOR J=1 TO CNUM
8170 PRINT "  'QUANTY$(QUANTY$(J)) ; INGRED$(CINGRED$(J)) "
8180 NEXT J
8190 FLAG=1
8200 NEXT I
8210 IF FLAG=0 THEN PRINT "Sorry, I don't have the recipe to 'ANSWER$'."
8999 GOTO 3200
-----
9010 REM PROCEDURE TO GIVE HELP ON COMMANDS
9020 PRINT "Help on Commands : "
9030 PRINT "  INITIALISE = Specify which ingredients are available."
9040 PRINT "  MODIFY      = Change the availability of an ingredient."
9050 PRINT "  SELECT      = Get a list of which cocktails can be made."
9060 PRINT "  CHECK       = Find out which cocktails use an ingredient."
9070 PRINT "  PRINT       = Print the recipe for a cocktail."
9080 PRINT "Type RYE to finish."
9999 GOTO 3200
-----
10010 REM FUNCTION TO DECODE STORAGE OF RECIPE
10020 REM INPUT IS : 1. CRECIPE$ = AN ENCODED RECIPE STRING
10030 REM OUTPUT IS: 1. CNAME$  = NAME OF COCKTAIL
10040 REM              2. CNUM   = NUMBER OF INGREDIENTS
10050 REM              3. QUANTY = ARRAY OF QUANTITY DESCRIPTORS (1..15)
10060 REM              4. CINGRED = ARRAY OF INGREDIENT NUMBERS (1..20)
10070 REM A). FIND SPLIT BETWEEN NAME AND INGREDIENTS
10080 FOR K=1 TO LEN(CRECIPE$)
10090 IF MID$(CRECIPE$,K,1)="/" THEN SPLIT=K
10100 NEXT K
10110 REM B). EXTRACT NAME OF COCKTAIL
10120 CNAME$=LEFT$(CRECIPE$,SPLIT-1)
10130 REM C). EXTRACT INGREDIENTS IN TURN
10140 CNUM=0
10150 FOR N=SPLIT+1 TO LEN(CRECIPE$) STEP 3
10160 CNUM=CNUM+1
10170 QUANTY(CNUM)=ASC(MID$(CRECIPE$,K,1))-ASC("A")+1
10180 CINGRED(CNUM)=VAL(MID$(CRECIPE$,K+1,2))
10190 NEXT K
10200 RETURN
11000 REM
11010 REM PROCEDURE TO DETERMINE WHICH RECIPES MAY BE MADE USING THE
11020 REM CURRENTLY AVAILABLE INGREDIENTS. CALLED BY SELECT AND CHECK.
11030 FOR I=1 TO NRECIP
11040 MAKES(I)=1
11050 CRECIPE$=RECIP$(I)
11060 GOSUB 10080 : REM DECODE RECIPE STRING
11070 FOR J=1 TO CNUM
11080 REM IF ANY INGREDIENT IS NOT AVAILABLE, THEN RECIPE CANNOT BE MADE
11090 IF AVAIL(CINGRED(J))=0 THEN MAKES(I)=0
11100 NEXT J
11110 NEXT I
11120 RETURN

```

from three parts white sugar to one part water. Decorate with maraschino cherries or slices of lime or lemon and serve with panache!

Cocktail selection

The Murphy's law of cocktail making states that: 'the desire for a cocktail varies inversely with the availability of its ingredients.' In other words: if you would like it, you can't make it. The following program sidesteps Murphy's law by preparing, from your ingredients, a list of cocktails that it is possible to make — a kind of recipe book turned inside out. You tell it what you have, it tells you what you can make. In fact, at my house, the guests use it themselves.

Let me describe the operation of the program by listing its commands and what they do:

INITIALISE: In response to the INITIALISE command, the program prompts you with the name of each ingredient in turn, and you reply 'Yes' if

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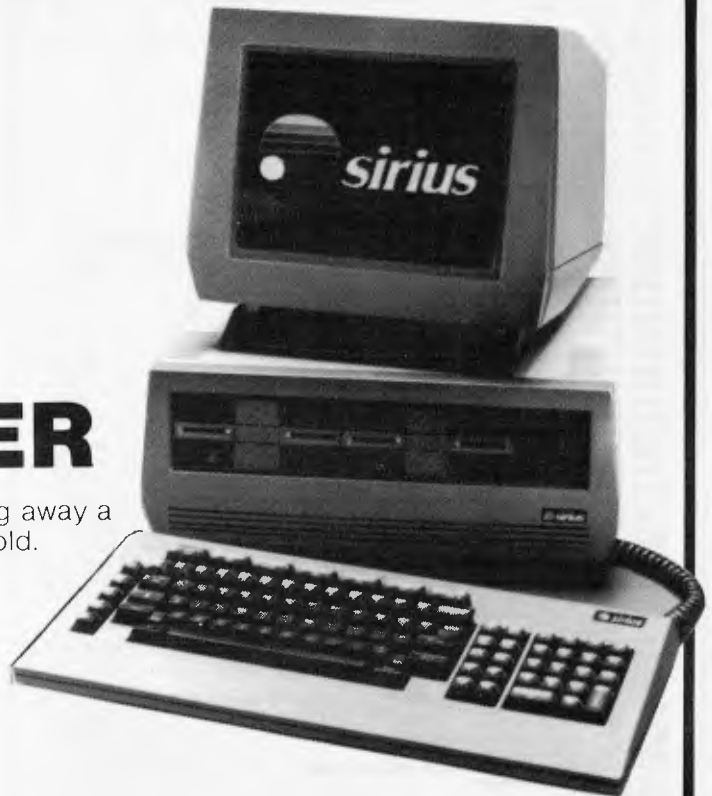
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DATA SHAKER

BASIC FOR THE COCKTAIL ENTHUSIAST

you stock it, or 'No' if you don't.

SELECT: Once you have initialised the availability of ingredients, the SELECT command will compute and list names of cocktails that can be made from those ingredients.

PRINT: From a cocktail name, you can list out its recipe with the PRINT command.

CHECK: An alternative means of searching for a cocktail is by the ingredients that it contains. The CHECK command allows you to ask which cocktails use a particular ingredient. You can use it to search for cocktails that might suit your taste. It also tells you which of those you can make.

MODIFY: When ingredients run out, or when you are experimenting, the availability of ingredients can be changed with the INITIALISE command all over again. Alternatively, the MODIFY command allows you to change the availability of particular ingredients by name.

There is also the command HELP which gives brief details about which commands do what, and BYE which takes you out of the program.

Program details

I have deliberately avoided a specific dialect of Basic to try to make the cocktail selection program more widely applicable. The Basic language in the listing is 'plain vanilla' Microsoft, although I have used long, variable names for clarity. However, the first two characters of the variable names can be used as unique identifiers.

The only real conversion problems you might have are with decoding the recipe strings. Each recipe is stored as a string of characters: firstly the name, then a dollar sign, then a list of ingredients. Each ingredient is encoded into three characters: a quantity descriptor (eg, 'one measure of') from the letters 'A' to 'O', and an ingredient number from '01' to '20'. The routine at line 10000 decomposes a recipe string into its constituent parts.

The program allows the use of truncated

command strings and recipe names, etc. through the use of a special string comparison statement (eg, line 3110). If you cannot convert this idea into your Basic, then a simple string comparison will do as well.

I have tried to keep to the more commonly available and most widely used ingredients for cocktail mixing. There are some famous cocktail names missing as a consequence. Ideally the ingredient and recipe data should be stored in a disk file or in DATA statements, I leave that — and the addition of more recipes — up to you.

Other ideas

My experience with this program shows that it generates a great deal of interest from non-computer people. I think that this is because it is *novel* and because it is *practical*. The program fulfils a function not easily duplicated by other means, and the computer is your assistant rather than your adversary.

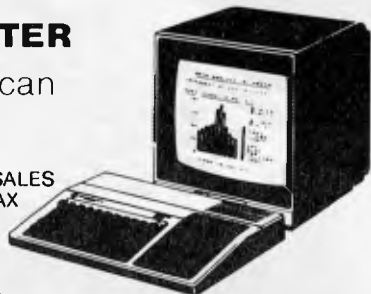
Novel and practical programs give home computing a credibility not generated by games software or by the current 'home finance' type software. While the cocktail selection program is not earth shaking, I think it is constructive in bringing home computer software to ordinary people.

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WARNIER ORR PROGRAMMING PART 3: NORMALISATION IN PRACTICE

In the penultimate part of this series Paul Overaa explains the procedure for normalising a set of data items.

We saw last month how it is possible to describe sets of data using Warnier diagrams. The general ideas involved in working backwards from the output of a program were illustrated leading to an initial Warnier diagram showing a program design for handling data input. I indicated that there are advantages to being able to impose different views on a data set without having physically to rearrange the data. This month I want to discuss a technique known as 'Normalisation' and show you some of the benefits that normalised data sets have in practice.

We were considering last month the production of a report for a company of consulting chemists. The primary data item set that we identified was described in terms of a logical input file using a Warnier diagram. This diagram is repeated in Fig 1 for convenience.

The word 'Entity' is used to describe a data item type that has 'real-life' existence. Such entities have various characteristics that we call 'Attributes'. To digress for a moment, if you were storing data about people then one entity you would deal with would be 'Person' and the attributes that you might wish to store about each person could be Name, Address, Telephone Number, Age and so on. If we return to Fig 1 then we see that the attributes of the entity Sample include Sample Identification Number, Commodity Name, Country of Origin, Type and also a collection of tests and test results that may occur more than once, eg, a particular sample may have half a dozen or more different analytical tests carried out on it. For this sample there will be that number of Test Names and Test Results present. Attributes like these that can occur more than once for a particular entity occurrence are called a 'Repeating Group'.

One obvious way to store our data set would be to regard Sample as the only entity and sequentially store the attribute values associated with particular Sample Identification Numbers as variable length records. This would represent our input file correctly but some of the data would be very awkward to get at. Imagine, for

instance, that you want to find those samples that had a test for 'percentage of moisture' carried out. It would be necessary to search sequentially the whole of the data file in order to find each occurrence of the test name 'Moisture'. Such information would in fact be much easier to obtain if the details for the tests were stored separately. The first stage of normalisation concerns itself with the problems that repeating groups cause and eliminates them by removing groups and rewriting them as new entities.

From a practical point of view it is useful initially to pick out from the Input file any attributes that are candidates for static file storage methods and rewrite these items as separate entities. By this I mean the attributes where you would be likely to store a code to represent the value rather than store the attribute value itself. Country of Origin is a typical candidate since we can encode up to 256 different countries of origin in one single byte. We would therefore like to maintain a static file containing the country names and the respective code numbers that are allotted. It should be fairly obvious that several candidates of this nature exist and it is immediately useful to rewrite them as new entities as follows:

```
Commodity  
(Commodity#, Commodity-Name)  
Origin      (Origin#, Origin-Name)  
Type        (Type#, Type-Name)  
Test        (Test#, Test-Name)
```

The # sign is frequently used to indicate a number and thus Commodity# is read as commodity number. We have written the four entities shown above in a common standard form and the notation is as follows: we write the name of the entity and then in brackets we list the attributes of the entity. The attribute or attributes that uniquely identify a particular occurrence of an entity type is called the 'key' or 'identifier' and is underlined. It is the identifier that is used to search for specific record occurrences in practice.

Having done this we can write our input file shown in Fig 1 as follows:

```
Sample (Sample#, Commodity#,  
Origin#, Type#, (Test#, Test-Result))
```

The identifier in this case is Sample# — ie, the Sample Identification Number.

At this point we are in a position to start what is usually regarded as the first stage of normalisation. The object is to remove any repeating groups from any currently identified entity descriptions and to rewrite them as new entities. In doing this it is necessary to include in the new entity all attributes that were identifiers in the original entity.

The result of doing this is shown below. Note that the act of separating the repeating group has resulted in us identifying another entity that we have called Analysis-Result.

```
Sample (Sample#, Commodity#,  
Origin#, Type#)  
Analysis-Result (Sample#, Test#, Test-  
Result)
```

It should be obvious that in order to identify uniquely a particular analysis result we would need to know to which test and to which sample we were referring. This being so we should not be surprised to see both identifiers present in the key.

The entities that we have selected to represent our logical input file are now free of repeating groups and are said to be in first normal form. It is convenient to list them together thus:

```
Commodity  
(Commodity#, Commodity-Name)  
Origin      (Origin#, Origin-Name)  
Type        (Type#, Type-Name)  
Test        (Test#, Test-Name)  
Sample      (Sample#, Commodity#,  
Origin#, Type#)  
Analysis-  
Result      (Sample#, Test#, Test-  
Result)
```

It is now necessary to examine each of the above entity descriptions to ensure that each non-identifying attribute (ie, attributes that are not part of the key) is functionally dependent on the whole of the key. This sounds frightening but it is very easy to do indeed. In effect all that we mean is that it must not be possible to identify uniquely an occurrence of a

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particular attribute without specifying the whole of the key. I think you will see what I mean as we work through the first normal forms.

Commodity (Commodity#, Commodity-Name)

This is an easy one since there is only one non-identifying attribute. Once we know a particular Commodity# then we have uniquely specified a Commodity-Name. Similarly, to specify a particular Commodity-Name we need only be in possession of Commodity#. It should be apparent that the attributes of the first four entities that we listed earlier, namely Commodity, Origin, Type and Test, are already such that the non-identifying attributes are functionally dependent on the whole key and other than recognising this fact we do not have to do anything to them.

Sample (Sample#, Commodity#, Origin#, Type#)

For the entity Sample we have three non-identifying attributes to be checked. We ask ourselves this question . . . 'Is it possible without specifying the Sample# of a sample to identify what commodity it is, its country of origin or its type?' Obviously to be able to say 'this sample comes from, eg, India' we would have to know to which sample we were referring, ie, we would have to know Sample#. I think you will agree that for all three cases we must know the Sample# before we can deduce the other attributes. In plain English we must know which particular sample we are talking about before we can say what it is, where it comes from or what type description it has. Again, therefore we do not have to do anything other than recognise that the attributes of this entity are already functionally dependent on the whole of the key chosen.

The last entity of our first normal set is Analysis-Result and in this case we have two attributes in our identifier or 'key'. Analysis-Result (Sample#, Test#, Test-Result)

We look at the non-identifying attribute Test-Result. Simply specifying the sample identification number Sample# would be insufficient to determine uniquely a test result because a particular sample may, as we have already indicated, have more than one analytical test carried out. Similarly it would be insufficient to specify a reference for the test carried out since there may be many samples that had such a test performed. It is necessary to specify both the sample number and the test in question before we can identify a particular test result value and thus as in the previous cases the non-identifying attributes are functionally dependent on the whole of the selected key.

In the example we are dealing with we see that the normal entity descriptions we produced initially are not only free from repeating groups but also exhibit the qualities of functional dependence we have talked of. But things might not have been this easy, and to give you a chance to see how to proceed in less fortunate cases I want you to imagine that, in addition to storing data about the analytical test results, we also need to know which laboratory performed the analysis. If this had been part of the problem requirements then the entity Analysis-Result would look like this: Analysis-Result (Sample#, Test#, Test-Result, Laboratory-Name)

We would convince ourselves as we did above that Test-Result was truly functionally dependent on both identifiers. We would then look at the attribute Laboratory-Name. In the case of our

example each particular laboratory is set up to do certain types of work, that is to perform a certain range of tests. This being so I think you will agree that you only need to specify the Test# to know which laboratory performed the test. The attribute Laboratory-Name is therefore not functionally dependent on the whole of the key. The solution is to remove this attribute from the entity Analysis-Result and create a new entity Laboratory as follows:

Laboratory (Laboratory#, Laboratory-Name)

In this way we would ensure that non-identifying attributes were in fact functionally dependent on the whole key. Having done this our collection of entities would be described as being in Second Normal Form.

The last stage that we need to consider concerns itself with the relations between the non-identifying attributes themselves. We want to ensure that, for any particular entity, no 'non-identifying attribute' is functionally dependent on any other 'non-identifying attribute'. This part of the procedure therefore only applies to entities with two or more non-identifying attributes and in our example we consider one entity only, Sample.

Sample (Sample#, Commodity#, Origin#, Type#)

By inspection I think you will agree that if we specify a particular commodity name by specifying or defining the value of Commodity# then this tells us nothing about the sample's origin or its type value. Similarly specifying a sample's origin or type value would not help us to identify what commodity it was. In this case we can safely say that non-identifying attributes of the entity Sample are mutually independent. If dependence is found, the procedure to follow is to remove the offending attribute by creating a new entity in just the same way as we would have created the entity Laboratory if we had been required to store details of which laboratory carried out which tests.

Once we had ensured that all non-identifying attributes are mutually independent we have created the famous 'Third Normal Forms' that you read about in the database books. Please remember that it takes far longer to explain these procedures than it does actually to do it.

Let's list the three steps that we have performed:

1. Write your initial entity descriptions in the bracket notation form and then remove any repeating groups that are present.
2. Check that the non-identifying attributes of each entity are functionally dependent on the whole of the identifier

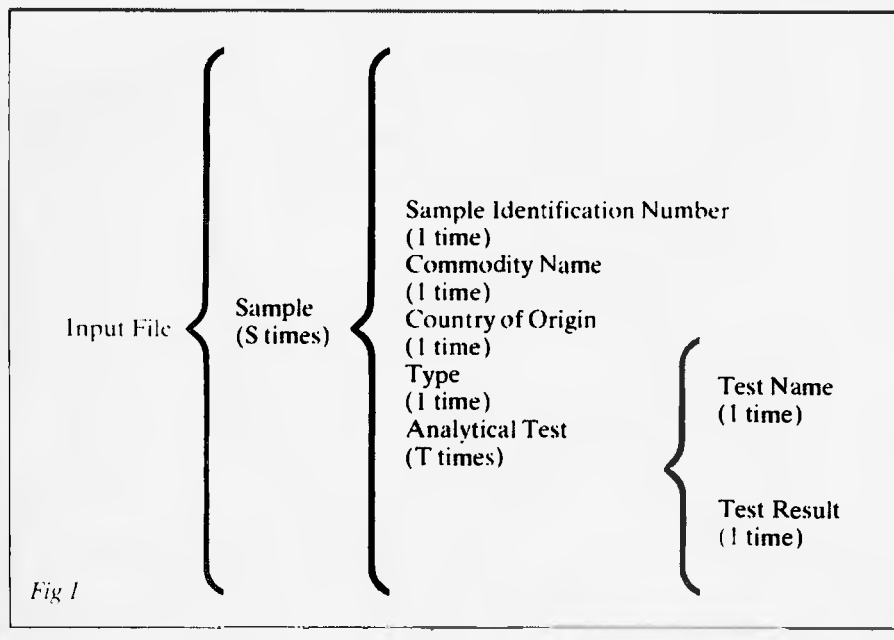


Fig 1

WARNIER ORR PROGRAMMING

PART 3: NORMALISATION IN PRACTICE

that you selected. If you find that some are not, then those particular attributes must be removed.

3. Lastly, you must ensure that all non-identifying attributes are mutually independent. Again if you find that this is not so then new entities must be created.

Look at Fig 2. This shows the entities and their relations. What we must now do is consider the ways in which such a representation could be implemented in practice. One quite simple method that could be used on many small disk-based computers would be to maintain separate files for each of the six entities. Random access files would be most suitable since we will wish to extract data by referring to specific keys rather than having to search through complete files.

It is necessary to decide what method will be used to indicate or define the relations that exist. Given a particular sample number, for instance, we could from the appropriate Sample record find what sort of sample it is, where it comes from and what type classification it had. We would also need to locate the analysis details and, since these will be placed in a separate file, we will need to know whereabouts in the Analysis-Results file the data has been placed. A simple solution is to use 'embedded pointers' within the Sample records, giving for instance the address or record number of the first result and also the number of tests that were carried out. In this way we could find out which records in the Analysis-Results file were associated with which records in the Sample file. Such embedded pointers could be used to specify all the relations needed.

More sophisticated ways of specifying the relations exist and the ultimate ideas of flexibility move into the realm of relational database design. I am not for one minute suggesting that such techniques are either necessary or appropriate for most applications. What I am saying is that we can frequently make use of the flexibility that a normalised relational view provides. The message then is, define your input set, normalise it and then implement the simplest physical file structure that is consistent with the resulting entity descriptions and your particular processing requirements.

Output file

We have considered, in a fair amount of detail, the input set. It is necessary also to consider the requirements of the

output set. The Warnier description of the report was given last month and it is possible to take the bracket description of the report and normalise it in the same way as we did for the input file. Since the process is identical to that of normalising the input file, I will simply state that if you do this, you will rediscover entities such as Commodity, Origin, Type, Test that are already known. You will, however, discover a new entity. It corresponds to a single line in the report and has therefore been called Report Line.

Report-Line (Commodity#, Origin#, Type#, Test#, N,L,H,A,S)

The characters N,L,H,A,S stand res-

pectively for the attributes No tested, Low, High, Average and Standard deviation as described last month.

There are two ways of creating our output or report:

1. We can compute the derived data each time new sample data is added and update a file that we would create called Report, ie, the responsibility of updating the derived data can be assigned to the input program. This is simple to do because during the input of a set of sample data the four keys required to locate a particular line in the report, namely, Commodity#, Origin#, Type# and Test#, would be known. If this approach were to be adopted the production of the report would merely entail listing the contents of the file Report.

2. Alternatively the report could be produced in real time by examining the

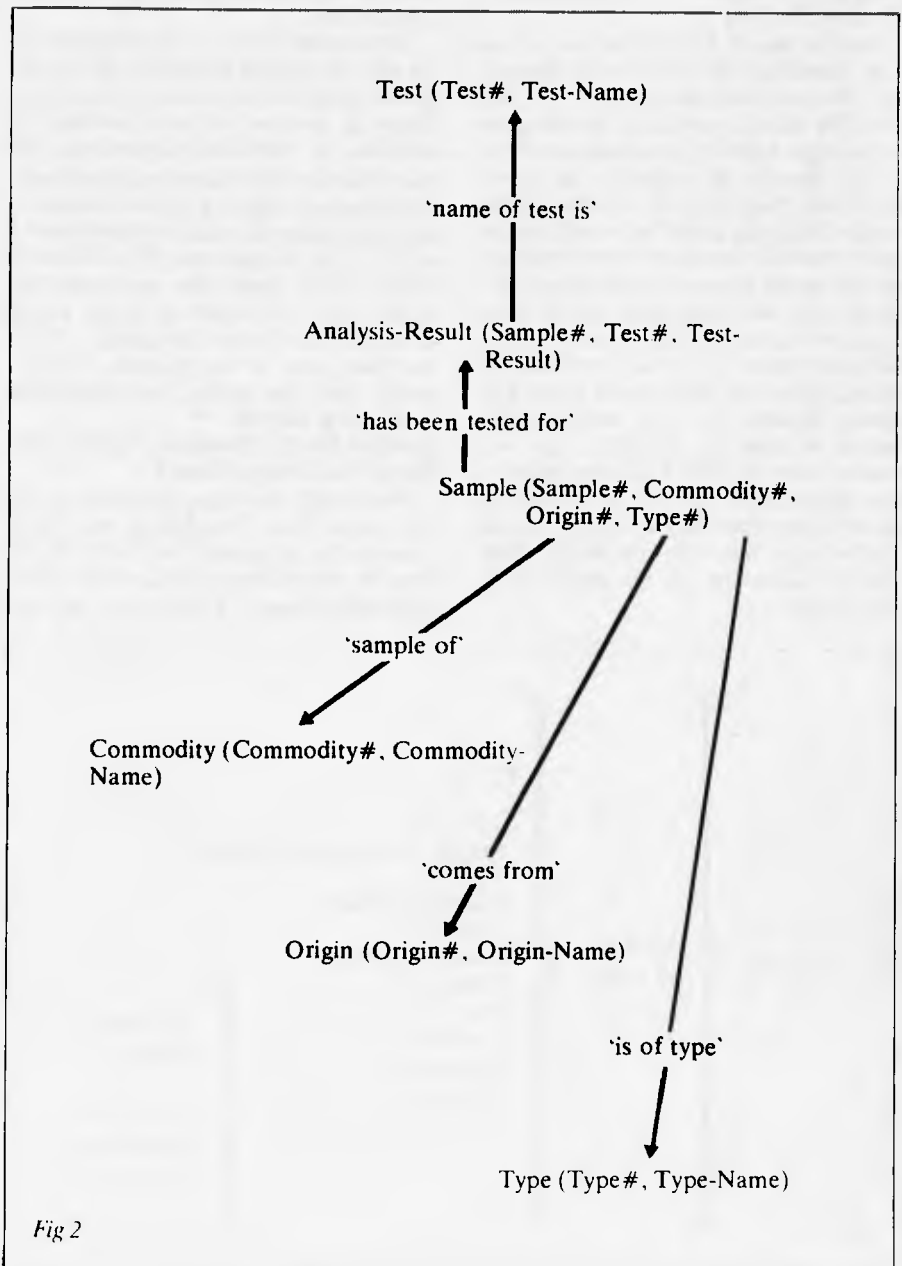


Fig 2

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individual sample data that had been stored during the year. Such a procedure is attractive for many reasons including the fact that we would not necessarily have to reserve disk space for the report. Such an approach would allow the implementation of quite sophisticated query facilities in addition to the main report if indeed these were required.

If we decided on this latter approach then we would have to arrange to be able to retrieve our data using the four part key Commodity#, Origin#, Type#, Test#. One way to implement this would be by using a further set of embedded pointers within the Analysis-Results file. Reading the file using these pointers would provide the required order for output processing.

To summarise, we can, by the use of pointers embedded in the record definitions of our entities, create logical paths

ways through a data set. In this way we can provide the view demanded by the output requirements even if that view is different from that of the input requirements. It is possible to do this because we paid special attention to the way we have chosen to represent our file structure. Normalisation enables us to identify a physical file structure that is well suited to having more than one logical view imposed upon it.

I have tried here to indicate the advantages of normalisation and have covered the basic steps involved in translating data sets into third normal form. The logical description produced is quite easily mapped to a true physical description and we have seen how embedded pointers within records can be used to imply the relationships between various records of various entities. You may well have your own ideas on other ways of

implementing the necessary relationships. I have attempted to show you some of the problems that we encountered while the software to handle the report used in the example was written. The steps involved in finding a suitable file structure are quite general and I think you will find these ideas useful in many of your own projects.

Next month is the last part of this series and I want to tie up the general principles that have been discussed during the last three months. I want also to show you one last use of the Warnier diagram . . . to design 'sets of programs'. I think that you may then agree with me that programming is beginning to change from an art to a fairly well defined technique that can be taught in much the same way as we teach other sciences.

END

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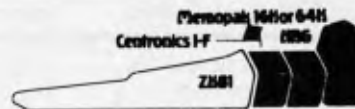
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DIARY DATA

**DIRECT
ACCESS**

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Hong Kong	Consumer Electronics Show 1983 Regent Hotel/New World Hotel Contact: Ms Narelle McKinnon on Sydney 232 2422	October 15-17, 1983
Brisbane	Computer Expo '83 Contact: Robert Woodland Exhibitions. Tel: (07) 372 3380	November 4-6, 1983
Melbourne	Data 83 Contact: Graphic Directions (02) 212 4199	November 8-10, 1983
Hong Kong	Percom '83 Contact: Adsdale Exhibition Services, 194 Lockhard Road, 20/F, Wanchai, Hong Kong	December 16-19, 1983
Sydney	The Australian Personal Computer Show Contact: Australian Exhibition Services (03) 20 1208	March 14-17, 1984

NETWORK NEWS

Here is a list of all Australian personal computer networks. As more networks appear — and as more facilities are added to existing ones — we'll report them in this section, which appears monthly.

CYBERNET. Operator: Control Data Australia Pty Limited, 493 St Kilda Road, Melbourne 3004. Telephone: (03) 268 9500. Sales offices in every capital city. Facilities: Access to hundreds of applications from statistical analysis, financial modelling, linear programming, structural analysis, mineral evaluation to data base management. Hours: 0600 to 2400, Monday to Friday.

MICOM CBBS. Operator: The Microcomputer Club of

Melbourne, P.O. Box 60, Canterbury 3126. Facilities: Computer bulletin board system, allows users to exchange messages on subjects of mutual interest. Free of charge. Hours: 24 hours/day, 7 days/week (single 'phone line only). Access number: 762 5088. Protocol: full duplex ASCII, 8 data bits, 1 stop bit, no parity.

INFONET. Operator: Network Services Division of Computer Sciences of Australia Pty Ltd, 460 Pacific Highway, St

Leonards, NSW. Tel: (02) 439 0033. Facilities: Access to databases produced by the Australian Bureau of Statistics and the Institute of Economic and Social Research. Hours (E.S.T.): Monday to Friday (7am to 9pm), Saturday (8am to 5pm) and Sunday (8am to 11.30am).

AUSINET. Operator: ACI Computer Services, P.O. Box 42, Clayton, Victoria. Tel: (03) 544 8433. Facilities: Medium to database whose subject coverage includes agriculture, education,

energy, industry, public affairs, science and technology and an online Australian database directory. Hours: 8.30am to 9.00pm E.S.T. Monday to Friday.

IP Sharp Associates Network. Operator: IP Sharp Associates Pty Ltd, 13th Floor, 175 Pitt Street, Sydney. Tel: (02) 232 6366. Facilities: The network is an international time sharing data processing network, the host computers being located in Toronto, Canada. Hours: 24 hours/day, 7 days/week.

USER GROUPS INDEX

Below is a list of alterations and additions to the list of user groups published in the June/July issue. The next full listing will appear in the December issue of APC.

NEW SOUTH WALES

A Sharp MZ 80B User's Group has just been formed and is looking for additional information. Contact Stephen Bannerman on (069) 62 5594 or write to P.O. Box 815, Griffith 2680.

A computer club has been formed in Deniliquin, New South Wales. The club meets the first Sunday of each month at The Airport Sewing Centre, 139 Davidson Street, Deniliquin. For information contact Wayne Patterson on (058) 81 3014.

Sydney Forth Group promotes FORTH a new computer language. Listings for language available for most processors. Write to S.F.G., 10 Binda Road, Yowie Bay 2228.

VICTORIA

A Kaypro Users Group is now operating in Melbourne. The next meeting is Sunday, 30th October 2pm at the Australian Council for Education Research, 9 Frederick Street, Hawthorn. All welcome.

Newsletter available monthly for interstate users. Membership \$20 per year. All enquiries to KUGVIC, P.O. Box 159, Forest Hill 3131.

The Color Computer Club is organising a symposium and exhibition devoted solely to the Tandy Color Computer.

The Exhibition is called "COLOR IN 83" and is to be held on Saturday 5th November 1983 at The Geelong College, Talbot Street, Newtown, Geelong.

In addition to Tandy software, demonstrations of other

adaptions of the Color Computer, including use of the 6809 microprocessor with FORTH and FLEX as operating systems and expanding its RAM to 64k, will serve to highlight the versatility of the TRS-80c.

The Symposium timetable is: 8.45am Registration of Participants, 9.00am Opening and key note of address, 9.20-11.00am Presentation of Papers, 11.00-11.15am Morning tea, 11.15-12 noon Workshops, 12.00-1.00pm Light lunch and Exhibition Preview, 1.00-7.00pm Exhibition open to the general public.

DIARY DATA

Papers presented will be published in a special issue of the club newsletter, "3CN". The special issue will be distributed to registered participants and club members. Copies will also be available to those who forward \$2.00 to the club through its President, Sandy Gray.

For further information contact The Color Computer Club President, Sandy Gray, 5 Walpole Avenue, Belmont, Vic 3216. Phone: (052) 44 1977.

QUEENSLAND

The members of the PEACH COMPUTER USERS GROUP QUEENSLAND invite all MB6890 users to join their group (established 1 year) which meets every 4th Tuesday monthly at 7.30 at Taringa Primary School Brisbane. The Group offers software library, advice, tech sheets, information, brains trust support and more! Contact Leo Burke, President on 356 6080 or Glen Thwaite, Treasurer on 298 4341 with mail to Brian K. Williams of 19 Patrick Street, Norman Park, Brisbane. Aust. Reg. User name WILLPATRONORM.

The Townsville Microbee User group (T-MUG) meets at 7pm on the second Monday of the month with another 'user' meeting held later in the month. Meetings are held at the Town & Country Computers, CTL Centre, Anne Street, Aitkenvale.

Anyone interested is invited to

contact our President Chris Hayes (077) 79 6065 or our Secretary John Johnson AH (077) 79 5628.

The PC1500 Bit Fiddlers Club can be contacted on (07) 395 1952. The group is mainly of interest to those with PC1500 or PC2 calculators (computers) but any pocket computers are welcome. Contact address is C L Burke, 947 Creek Road, Carindale 4152.

The TRS-80/System 80 Users Group meets on the first Sunday of the month at Lindium Hall, commencing at 1.30pm. Phone enquiries can be made on 396 2998.

SOUTH AUSTRALIA

Microbee Users Group of South Australia membership is \$15.00 per annum which includes 11 newsletters. For further information on membership, meetings, newsletters, etc contact Brian Uren on (08) 260 5038 (6-8pm) or by mail to G.P.O. Box 767, Adelaide, S.A. 5001.

The IBM PC SA Users group (to which all 8088 users are welcome) can be contacted on (08) 261 9590, Don Richards, or write to P.O. Box 68, Walkerville 5081.

The Adelaide Kaypro User Group has just started. Any interested parties should write to 100 Pirie Street, Adelaide, Attn: The Adelaide Kaypro User Group.

Interested persons may obtain information about the Adelaide Atari Computer Club from the Secretary, P.O. Box 333, Norwood 5067. At present the Club has 40 members, meets monthly and produces a Club magazine.

ACT

There have been a number of changes to details of the Canberra Micro-80 Users Group. The latest information is: The group caters for owners/users of TRS-80s, System 80s and other Z80 based micro-computers.

It meets on the third Monday of each month in the small lecture theatre of Building J of the Canberra Technical College, Constitution Avenue, Reid at 7.30pm. Experts and novices are welcome.

Subscription is \$12.00 per year and includes a monthly newsletter.

Contact: Secretary (Milt Cottee), 33 Crawford Crescent, Flynn, (062) 58 2637 AH.

will begin also and members will be notified by mail.

The club is open to all owners of Spectravideo Computers and to all persons who are planning to purchase a Spectravideo Computer.

Send mail to Mr P W Deckert, 48 Heather Street, Launceston 7250 or phone 444836.

WESTERN AUSTRALIA

The VIC-UPS Computer Users' Group (for VIC-20 and 64 users) is planning a VIC-20 and C-64 "Convention" probably on November 26th and 27th this year. Plans so far include demonstrations of new hardware/software (from club and commercial sources), a hardware/software "swapmeet" and an educational debate and forum of guest speakers on the connection of home and school use of personal computers by children. The convention will be held at the club's venue at the Clark Lecture Theatres at Sir Charles Gairdiner Hospital in Hollywood, WA.

Members of other computer clubs, the general public and computer buffs from interstate will be welcome at the convention, and their ideas and comments beforehand will be very welcome. The club usually meets on the 2nd and 4th Tuesdays (7.30) and the 3rd Saturday (all afternoon) each month. All such meetings are open to visitors, and to dealers who want to demonstrate their latest gear.

TASMANIA

The Spectravideo Computer Users Group of Tasmania has a membership fee of \$15 which entitles members to the monthly newsletter that is beginning shortly and to discounts in computer equipment as they become available to the club.

A monthly meeting of the club

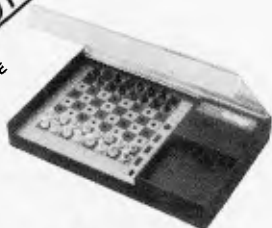
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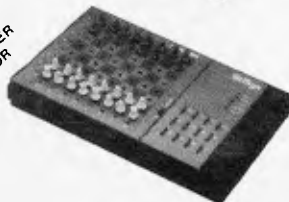
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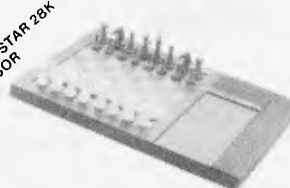
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- EASY TO SET UP, VERIFY AND ADD PIECES

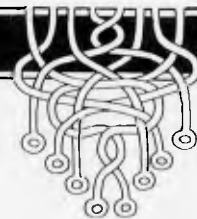
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LAZING AROUND



Quickie

Arrange the numbers 1-9 in a 3x3 grid so that all columns, rows, and diagonals add up to the same value.

9	8	7
6	5	4
3	2	1

Note: each difference is only counted once.

Prize Puzzle

Arrange the digits 1-9 in the 3x3 grid shown. Calculate the sum of differences between squares which are adjacent horizontally or vertically, but not diagonally. Thus, in the example shown, the sum would be 24 made up of:

$$(9-8) + (9-6) + (8-7) + (8-5) + (7-4) + (6-5) + (6-3) + (5-4) + (5-2) + (4-1) + (3-2) + (2-1)$$

What arrangement gives the maximum sum and what arrangement gives the minimum sum?

Answers please — postcards or backs of envelopes only — showing maximum and minimum sums plus the arrangements, to reach APC Lazing Around, October Prize Puzzle, P.O. Box 298, Clayton, Vic 3168.

June Prize Puzzle

A rather easy puzzle in logic — at least to anyone familiar with Venn diagrams. Over 200 entries were received — mostly with the correct solution of 10 cats.

Steven Green is the lucky man drawn from the hat. His prize is even now winging its way to Monterey. See you next month.

J J Clessa

BLUDNERS

Andrew Lamb has found a bug in 'Domain of the Djinn', published in APC, August issue. he suggests the following alterations:

In line 6000, the statement Y1 = RND(8)-1 should read Y1 = RND(7)-1.

Also line 62 in 'Escape Maze' published in the May issue of APC needs to be changed to
62 IF X < 60 AND Y < 40 THEN GOTO 27.



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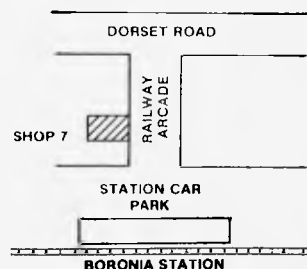
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THE BIG SQUEEZE

It was a hot summer night and the heat was on in more ways than one. I reached over and flicked on the power. The screen went green and blinked READY. Time to get busy. Just then the phone rang.

"Andrews," it barked, "have you come up with those figures yet?"

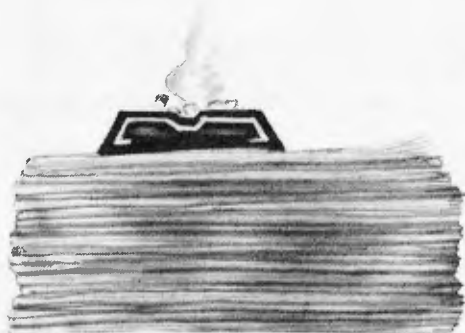
"Take it easy," I said. "I'm on the case."

"Andrews, you won't have the fingers to *grip* a bloody case if you don't deliver the goods. Nobody messes with the firm.

"OK, OK," I whined. "Just give me 'til tomorrow morning . . ."

There was a grunt and then just the purr of a dialling tone. My hands were sweaty and it wasn't from the sweet and sour pork I'd had for lunch. I poured a shot of bourbon and rummaged for the July issue of Australian Personal Computer. There was an article on sub-routines in the January issue which might save me several hours of number-crunching. Now where was that issue?"

Ten minutes later the first pricklings of panic ran up my spine. It had vanished. If only I'd ordered a Mark II APC Binder to keep the copies in. Already I could imagine the roaring whine of the chain saw . . . maybe they'd only take a *few* fingers. . .



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PROGRAMS

APC is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs to APC please include the following:

- (a) A cassette or disk of the program.
- (b) A listing on plain, white paper (typewritten if no printer available).
- (c) Comprehensive but brief documentation.
- (d) A suitable sae if you would like your materials to be returned after use.

Please mark (a), (b) and (c) with your name and address, program title, machine (state minimum RAM where appropriate) and — if possible — a daytime phone number. All programs must, please, be fully debugged. Send contributions to:

APC Programs, P.O. Box 298, Clayton, Vic. 3168.

We'll do our best to acknowledge receipt of programs as quickly as possible, but following this acknowledgement it will usually be some time before a decision can be made, so please be patient! Generally speaking, programs which are rejected for any reason are returned fairly quickly, so 'no news . . .'

You'll no doubt have noticed some strange-looking symbols alongside this month's Programs. Judging by reader feedback it seems that most people are primarily interested in one class of program, be it games, utilities or whatever. With this in mind, we've decided to help you identify programs quickly using the symbols.

Of course not all programs will fit into one of these categories, so these have not been given a symbol.

-  Games
-  Scientific/mathematic
-  Business
-  Educational/Computer Aided Learning
-  Toolkit/utilities



Atari No-Trons

by Martin Stiby

'No-Trons' is an arcade-type game for the Atari 400 with a games paddle (NB: paddle, not joystick). You have a gun at the bottom of the screen and a target at the top. You control the gun, using the paddle, and the computer controls the target. In between the two, a number of No-Trons glide happily across the screen from right to left. Your job is to blast the living daylight out of the lovable little creatures. If more than one No-Tron manages to reach the same point on the left-hand side of the screen, your score is displayed and

the game restarts.

There are a number of skill levels available, selected by twiddling the paddle and then hitting the fire button at the beginning of the game. The higher the skill level, the faster the pace.

The number of POKES and data statements make the game all but impossible to modify for readers without a paddle. As our referee puts it: 'They will be really up the creek, as it were!' Thank you, Phil. Don't call us . . .

```

0 GOTO 1000
100 =USR(1536):ON X-1536 GOTO 200,500,400
200 SOUND B,50,4,15:POKE 712,48:COLOR 1:M=PEEK(1789):N=PEEK(1791):PLOT M,79:DRAW
TO N,A:COLOR A:PLOT M,79
210 DRAWTO N,A:POKE 712,A:SOUND B,A,A,A:IF PEEK(53252)=A THEN GOTO C
220 POKE 1787,A:M=PEEK(1785):POKE 1785,225:FOR P=14 TO A STEP -2:SOUND B,P,8,15-
P:POKE 704,P:POKE D,M-4
230 POKE 53256,B:FOR P1=B TO 30:NEXT P1:POKE D,M:POKE 53256,A:FOR P1=B TO 30:NEX
T P1
240 NEXT P:POKE 712,A:SOUND B,A,A,A:POKE D,225:POKE 53278,A:SC=SC+(175-M):GOTO C
400 POKE D,225:POKE 1787,A:POKE 1785,220:FOR P=5 TO 70 STEP 2:POKE 707,P:SOUND B
,P,12,15:SOUND 2,P-5,12,15
410 NEXT P:SOUND B,A,A,A:SOUND 2,A,A,A:POKE 707,182:M=PEEK(1741)+R1:FOR P=M TO M
+5:POKE P,A:NEXT P
420 POKE 53278,A:GOTO C
500 POKE D,225:POKE 1787,A:POKE 1785,220:POKE 53249,A:POKE 53250,A:POKE 53251,25
    
```



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PROGRAMS

```

5:GRAPHICS 2:POKE 710,18
510 POKE 756,226:POKE 708,A:POKE 709,88
520 PRINT #6;" "
530 PRINT #6;" "
540 PRINT #6;" "
550 PRINT #6;" "
560 PRINT #6;" "
570 PRINT #6;" "
580 FOR P=82 TO 94:POKE 709,P:POKE 712,P-2:POKE 708,P-2:SOUND A,P-82,8,P-79:NEXT
P
590 FOR P=94 TO 82 STEP -1:B:POKE 709,P:POKE 712,P-2:POKE 708,P-2:SOUND A,P-82,8,
P-79:NEXT P:POKE 708,A
600 POKE 709,90:POKE 712,A:SOUND A,A,A,A:PRINT " IN LEVEL ";Z;" YOUR SCORE WAS "
;SC:PRINT:GOTO 2900
1000 R=PEEK(106)-32:POKE 54279,R:POKE 53277,2:POKE 708,110:GRAPHICS 0:POKE 710,1
8:R=RA256:R1=R+910
1500 FOR P=R+516 TO R+891:POKE P,0:NEXT P:FOR P=1 TO 6:READ P1:POKE R+742-2,P1:P
OKE R+777+P,P1:NEXT P:POKE 1790,99
1510 DATA 127,127,42,42,20,20
1520 POKE 705,120:POKE 706,90:POKE 704,8:POKE 53278,0:POKE 1785,225:POKE 707,182
:R=R/256+2:A=0:B=1:C=1000
1530 D=53248
1600 FOR P=1536 TO 1783:READ P1:POKE P,P1:NEXT P:FOR P=8 TO 7:READ P1:POKE P1,R:
NEXT P
1610 DATA 104,173,112,2,24,106,56,141,255,6,169,175,237,255,6,141,2,208,238,252,
6,173,252,6,56,233,120,208,42
1620 DATA 169,0,141,252,6,169,1,24,109,254,6,141,254,6,141,1,208,56,233,175,240,
15,173,254,6,56,233,61
1630 DATA 208,12,169,1,141,35,6,208,5,169,255,141,35,6,169,4,45,120,2,208,34,173
,251,6,56,233,5,240,26,230,251,6
1635 DATA 169,131,56,237,255,6,141,255,6,169,1,133,212,173,254,6
1640 DATA 56,233,44,141,253,6,96,238,258,6,173,250,6,56,233,255,208,122,169,0,14
1,250,6,206,249,6,173,249,6
1650 DATA 56,233,40,208,5,169,2,133,212,96,169,8,56,237,12,208,200,5,169,3,133,2
12,96,173,249,6,141,0,208
1660 DATA 173,10,210,201,200,144,16,238,205,6,169,77,56,237,205,6,208,23,206,205
,6,208,10,201,55,176,14
1670 DATA 206,205,6,169,0,56,237,205,6,208,3,238,205,6,162,30,169,24,157,15,34,1
57,19,34,169,60,157,16,34
1680 DATA 157,10,34,169,255,157,17,34,169,0,157,14,34,157,20,34,138,109,249,6,14
1,192,2,141,0,210,76,1,6
1690 DATA 1746,1749,1754,1757,1762,1767,1770
2000 PRINT "***** NO-TRONS *****"
2020 PRINT "***** by Martin Stiby *****"
2040 PRINT " You are working in an atomic-"
2050 PRINT "physics laboratory, studying a new and"
2060 PRINT "dangerous form of anti-matter, called"
2070 PRINT "no-trons. Suddenly the machine"
2080 PRINT "holding the no-trons malfunctions. If"
2090 PRINT "any escape to the outside, the lab"
2100 PRINT "will be annihilated."
2110 PRINT " There is a Green-screen set up, which"
2120 PRINT "will stop a no-tron, but only once in"
2130 PRINT "the same place. As well as this there"
2140 PRINT "is a semi-automatic pro-tron ray gun."
2150 PRINT "The gun consists of two guiding-bases"
2170 PRINT "The bottom one is moved by the lab"
2180 PRINT "computer, while the top one, you move."
2190 PRINT "When the trigger is pressed, the ray"
2200 PRINT "will fire between these two points ;"
2210 PRINT "neutralising any no-tron in its way."
2220 PRINT " Only five shots at each no-tron are"
2230 PRINT "available. The later the no-tron is"
2240 PRINT "hit, the more points you get. Use the"
2250 PRINT "paddle to change levels : "
2900 POKE 752,B:PRINT "(Press trigger to start) LEVEL : ";J
2920 IF PTRIG(A)=A THEN 2920
2930 Z=INT(PADDDLE(A)/22.9):PRINT "+";Z;:IF PTRIG(A)=8 THEN 2930
2940 POKE 1562,150-2X10:POKE 1656,255-2X20.5:GRAPHICS 23:POKE 708,110:POKE 559,4
2
2950 SOUND A,A,A,A:POKE 53761,134:FOR P=9092 TO 9211:POKE P,255:NEXT P:POKE 5325
1,50:POKE 53278,A:SC=A:GOTO C

```



TRS-80/System 80 Multi-Maths

by B. Snell

'Multi-Maths' is a menu-driven mathematical calculation program for the 16k the 16k TRS-80 and System 80.

The program is intended to be of use to anyone needing to carry out a significant number of assorted calculations. Although it doesn't do anything that couldn't be done on a programmable calculator, it has the advantage of holding thirteen routines on memory as well as offering annotated input and output, of course. As well as being a useful program to the more mathematically-inclined, some of the routines will doubtless come in handy for inclusion in other programs.

The thirteen options offered by 'Multi-

Maths' are:-

- A Circle finder
- B Combinations
- C Factorials
- D Logarithms
- E Least squares curve fitting
- F Permutations
- G Pythagorean triplets
- H Polynomial evaluation
- I Quadratic equations
- J Rational fractions
- K Statistics
- L Simultaneous linear equations
- M Spearman's coefficient of rank correlation

PROGRAMS

Most of the above should be self-explanatory, but to briefly run through them . . .

*Circle finder requests coordinates of three points. It then calculates the radius and centre of the circle passing through them (assuming the points do not lie on a straight line).

*Combinations calculates the number of possible combinations of n objects taken in groups of r . The largest number of objects the routine can handle is 33.

*Factorials calculates the factorial of any given positive integer. The routine is fairly fast, taking about fifteen seconds to find the factorial of 1000 (compare that with the speed of a scientific calculator!). For values up to 3199, the routine tells you roughly how long you'll have to wait; for values larger than this, it tells you to 'prepare for a long wait.'

*Logarithms calculates, as you'd expect, the logarithm of any positive number to any given (positive) base.

*Least squares curve fitting fits an equation of degree 1, 2, 3, 4, 5 or 6. You can enter up to 50 coordinates in the form 'x,y'. The routine will request the degree of polynomial — 1 fits a straight line, and, generally, the higher the order of polynomial the better the fit (assuming a straight line fit isn't appropriate). Higher orders of equation, of course, require more data than lower orders.

*Permutations calculates the number of permutations of n objects taken in groups of r . As for combinations, the maximum number of objects is 33.

*Pythagorean triplets calculates all possible whole number values of primitive

pythagorean triangles, giving the two sides and hypotenuse. 'Primitive' means that having found 3-4-5, the routine doesn't waste time looking for multiples like 6-8-10, 30-40-50 and so on.

*Polynomial evaluation calculates the value of any given polynomial with the constant term, variable x and coefficient of x being entered by the user.

*Quadratic equations calculates the real or complex roots of $X1$ and $X2$ when given the coefficient of the X squared term, coefficient of X term and the constant.

*Statistics requests a set of numeric data which it sorts into ascending order. It then calculates the arithmetic and geometric means, the median, sum of values, minimum and maximum, range, mid-range, variance and standard deviation.

*Spearman's coefficient of rank correlation attempts to find correlations between two given sets of data. This is a standard technique used to test the validity of data.

It's a great pity that 'Multi-Maths' wasn't written in modular form. Admittedly, TRS-80 Basic doesn't exactly go out of its way to encourage structured programming, but a modular structure would have made it easy for readers to borrow routines for inclusion in their own programs. As it is, the program tends to jump about a little. Still, we have no doubt that both the program as a whole and a number of the routines in it will prove useful. In order to save memory for data entry, the program is highly-compressed and has no REM statements, so care should be taken when typing it in.

```

4 CLS:PRINT"          DO YDU WANT :-":PRINT"
A .. CIRCLE FINDER
B .. COMBINATIONS
C .. FACTORIALS
D .. LOGARITHMS TO ANY BASE
E .. LEAST SQUARES CURVE FITTING
F .. PERMUTATIONS
G .. PYTHAGOREAN TRIPLETS
H .. POLYNOMIAL EVALUATION":
6 PRINT"
I .. QUADRATIC EQUATIONS
J .. RATIONAL FRACTIONS
K .. STATISTICS
L .. SIMULTANEOUS LINEAR EQUATIONS
M .. SPEARMAN'S COEFFICIENT OF RANK CORRELATION":PRINT:PRINT"
ER FROM A TO M":
8 A$=INKEY$:IFA$<"A"ORA$>"M",B ELSE ON ASC(A$)-64 GOTO
34,90,64,76,156,92,18,50,116,10,202,128,226
10 CLS:CLER:PRINT"RATIONAL FRACTIONS":PRINTSTRIN$(10,45):
PRINT"
GIVES FRACTIONAL APPROXIMATIONS OF A DECIMAL NUMBER":PRINT:
INPUT"INPUT THE NUMBER ":A:B=A:D=1:E=1:FORG=1TO11:K=INT(A):
J=D:D=K*D+C:G=J:J=F:F=K*F+E:E=J
12 IFA=KORB=D/F:THENPRINT:PRINTD"/"F,:GOTO14ELSEA=1/(A-K):NEXTG:
PRINT:PRINTD"/"F:GOTO16
14 PRINT" EXACT TO THE LIMITS OF THE COMPUTER"
16 PRINT:GOSUB222:IFX=1,4ELSE10
18 CLS:CLER:DEFINTA-Z:PRINT"PYTHAGOREAN TRIPLETS":
PRINTSTRIN$(20,45):PRINT"
THIS WILL DISPLAY ALL WHOLE NUMBER VALUES FOR THE TWO SIDES ANDTHE HYPDTENUSE O
F RIGHT-ANGLED TRIANGLES.

THEY ARE CALLED 'PRIMITIVE' BECAUSE NONE IS A MULTIPLE OF":
20 PRINT"
ANOTHER.
FOR INSTANCE, THE WELL-KNOWN 3,4,5 TRIANGLE IS
CALCULATED, BUT THE PROGRAM DOESN'T WASTE TIME AND EFFORT IN
FINDING ONE WITH SIDES OF 6,8,10 OR 30,40,50 .":PRINT:PRINT"
PRESS ANY KEY TO SET IT RUNNING.":A$=INKEY$
22 A$=INKEY$:IFA$="",22ELSECLS
  
```

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PROGRAMS

```
24 B$="SIDE 1          SIDE 2          HYPOTENUSE          TRIPLET NO.
=====;D=2;K=1;E=0;F=1;PRINTB$
26 A=D*D-F*F;B=2*D*F;C=D*D+F*F;PRINT@112,K;
   PRINT@ (E+2) *64,A,B,C;K=K+1;E=E+1;IFK<10,30
   ELSEPRINT@832," PRESS 'E' TO END OR 'C' TO CONTINUE"
28 A$=INKEY$;IFA$="E",4ELSEIFA$="C" CLS;PRINTB$;E=0ELSE28
30 F=F-2;IFK=0 THEN D=D+1;F=D-1;GOTO26ELSEJ=F;H=D
32 N=INT (H/J);G=H-(J*N);
   IFG<0 H=J;J=G;GOTO32ELSEIFJ<>1,30ELSE26
34 CLS;CLEAR100;PRINT"CIRCLE FINDER";
   PRINTSTRING$(13,45);PRINT
   YOU ENTER THE X AND Y CO-ORDINATES OF THREE POINTS WHICH DON'T ALL LIE ON A STR
   AIGHT LINE AND I WILL GIVE THE RADIUS AND THE
   X AND Y CO-ORDINATES OF THE CIRCLE WHICH PASSES THROUGH THEM"
36 PRINT
   SOMETIMES A DIVISION-BY-ZERO ERROR WILL OCCUR.
   WHEN THIS HAPPENS, SIMPLY CHANGE ONE OF THE VALUES OF THE X
   ORDINATES THAT ARE EQUAL, BY 0.00001 . "
38 PRINT " IF A DIVISION-BY-ZERO ERROR STILL PERSISTS THEN THE
   THREE POINTS ALL LIE ON A STRAIGHT LINE."
40 A$="ENTER THE FIRST POINT ";B$="ENTER THE SECOND POINT ";
   C$="ENTER THE THIRD POINT ";X$="X CO-ORDINATE ";
   Y$="Y CO-ORDINATE ";PRINT:PRINTA$;X$;INPUTX1;PRINTA$;Y$;
   INPUTY1;PRINT:PRINTB$;X$;INPUTX2;PRINTB$;Y$;INPUTY2;PRINT
42 PRINTC$;X$;INPUTX3;PRINTC$;Y$;INPUTY3;P=X2-X1;Q=X2+X1;
   R=Y2-Y1;S=Y2+Y1;T=X3-X1;U=X3+X1;V=Y3-Y1;W=Y3+Y1
44 A=(P*Q+R*S)/(2*P);B=(T*U+V*W)/(2*T);C=R/P;D=V/T;
   Y=(B-A)/(D-C);X=B-D*Y;R=90R/(X3-X)[2+(Y3-Y)[2];CLS
46 PRINT"THE CIRCLE WHICH PASSES THROUGH THE POINTS :-";PRINT:
   PRINT"X1 = ";X1,"Y1 = ";Y1;PRINT"X2 = ";X2,"Y2 = ";Y2;
   PRINT"X3 = ";X3,"Y3 = ";Y3;PRINT:PRINT"HAS A RADIUS OF 'R';
   PRINT:PRINT"WITH ITS CENTRE LOCATED AT";
   PRINT"X = ";X,"Y = ";Y
48 GOSUB222;IFX=1,4ELSECLS;GOTO40
50 CLS;CLEAR100;PRINT"POLYNOMIAL EVALUATION";
   PRINTSTRING$(21,45)
52 PRINT@192,CHR$(30);
   PRINT@192,"ENTER THE HIGHEST POWER OF X IN YOUR EQUATION ";
   INPUTN;IFN<=0ORN<>INT (N) THENPRINT@320,"NOT A VALID ENTRY";
   GOTO52ELSEPRINT@320,CHR$(30);DIMA(N+1);N=N+1
54 A$="ENTER COEFFICIENT OF X TO THE POWER ";J=N-1;FORI=1TON-1;
   PRINTA$;J; " ";INPUTA(I);J=J-1;NEXT;
   PRINT"ENTER THE VALUE OF THE CONSTANT TERM ";INPUTA(N)
56 PRINT:
   PRINT"WHAT IS THE VALUE OF X TO INSERT INTO THE EQUATION ";
   INPUTX;C=A(1);FORI=2TON;C=C*X+A(I);NEXT;CLS;PRINT:
   PRINT"YOUR POLYNOMIAL HAS THE VALUE";PRINT:PRINTC;PRINT:
   PRINT"FOR X = ";X;PRINT
58 PRINT
   WANT ANOTHER X WITH THE SAME POLYNOMIAL < 'Y' OR 'N' > ? "
60 A$=INKEY$;IFA$="N",60ELSEIFA$="Y" CLS;GOTO56ELSEIFA$="N" PRINT:PRINT
   WANT TO TRY A NEW POLYNOMIAL < 'Y' OR 'N' > ?";
   GOTO52ELSE60
62 A$=INKEY$;IFA$="N",4ELSEIFA$="Y",50ELSE62
64 CLS;CLEAR;PRINT"FACTORIALS";PRINTSTRING$(10,45)
66 PRINT@128,CHR$(30);:INPUT"ENTER THE NUMBER ";X;IFX<0THEN
   PRINT@256,"MUST BE POSITIVE";CHR$(30);GOTO66
   ELSEPRINT@256,CHR$(30);IFX<>INT (X) THEN
   PRINT@256,"YOU NEED EULER'S 'GAMMA' FUNCTION. TRY AGAIN.";
   GOTO66ELSEPRINT@256,CHR$(30);B=1
68 Y=1;E=5;Z=1E-5;IFX=0ORX=1THENB=1;GOTO74ELSEIFX<500,72
   ELSEIFX<600 S=10 ELSEIFX<1000 S=15 ELSEIFX<1500 S=30
   ELSEIFX<3200 S=60 ELSE PRINT"PREPARE FOR A LONG WAIT";GOTO72
70 PRINT@256,"WAIT FOR ABOUT'S"SECONDS"
72 FORC=2TOX;B=B*C;IFB<YTHENNEXTC;GOTO74ELSEB=B*B;A=A+5;NEXTC
74 PRINT@256,CHR$(30);PRINT:PRINT"X"FACTORIAL =";PRINT:
   PRINTB;"TIMES 10 TO THE POWER"A;GOSUB222;IFX=1,4ELSE64
76 CLS;CLEAR;PRINT"LOGARITHMS TO ANY BASE";PRINTSTRING$(22,45)
78 PRINT@192,CHR$(30);:PRINT@192,"INPUT THE NUMBER ";INPUTN;
   IFN=0THENPRINT@320," MUST BE POSITIVE";GOTO78
80 PRINT@320,CHR$(30);:PRINT@320,"ENTER THE BASE ";INPUTB;
   IFB<=0THENPRINT@448," MUST BE POSITIVE";GOTO80ELSE
   IFB=1THENPRINT@448," THE RESULT IS INFINITY";GOTO88
82 L=LOG (N)/LOG (B);PRINT@448,CHR$(30);
   PRINT@448,"THE LOGARITHM OF'N' TO THE BASE'B' - ";L;PRINT:
   PRINT"IN OTHER WORDS";PRINT
84 IF L<0 THEN F$="1 /";L=ABS (L) ELSE F$=""
86 PRINTF$;B;"RAISED TO THE POWER 'L' = "N
88 GOSUB222;IFX=1,4ELSE76
90 CLS;CLEAR100;PRINT"COMBINATIONS ";XX=1;GOTO94
92 CLS;CLEAR100;PRINT"PERMUTATIONS ";XX=2
94 PRINT"OF 'N' OBJECTS TAKEN 'R' AT A TIME";
   PRINTSTRING$(48,45)
96 PRINT@128,CHR$(30);PRINT@128,"HOW MANY OBJECTS ";INPUTN;
   IFN<=0ORN<>INT (N)ORN>33THEN
   PRINT@256,"MUST BE WHOLE POSITIVE NUMBER LESS THAN 34";GOTO96 ELSEPRINT@256,
   CHR$(30)
98 PRINT@256,CHR$(30);PRINT@256,"NUMBER OF OBJECTS IN GROUP ";
   INPUTR;IFR<=0ORR<>INT (R) PRINT@384,"MUST BE A WHOLE NUMBER"; CHR$(30);BOTO9
   ELSEIFR>N
   PRINT@384,"NUMBER IN GROUP CAN'T BE GREATER THAN NUMBER OF OBJECTS";GOTO98ELSE
   PRINT@384,CHR$(30);
100 X1=N;GOSUB114;Z=X3;X1=N-R;GOSUB114;Y=X3;X1=R;GOSUB114;
   W=X3;ON XX GOTO 102,106
102 C=Z/Y/W;IFC=1 P$=" IS "E$="ELSEP$=" ARE ";E$="S"
104 PRINT"THESE";P$;"COMBINATION";E$;GOTO110
106 P=Z/Y;IFP=1 P$=" IS "E$="ELSEP$=" ARE ";E$="S"
108 PRINT"THESE";P$;"PERMUTATION";E$
110 IFN=1 Z$="ELSEZ$="S"
112 PRINT"OF'N'OBJECT";Z$;" TAKEN'R'AT A TIME";GOSUB222;
   IFX=1,4ELSE ON XX BOTO 90,92
114 X3=1;FORJ=1TOX1;X3=J*X3;NEXTJ;RETURN
116 CLS;CLEAR;PRINT"QUADRATIC EQUATIONS";PRINTSTRING$(19,45)
118 PRINT@192,"ENTER COEFFICIENT OF X SQUARED TERM ";INPUTA;
   PRINT@320,CHR$(30);
   PRINT@320,"ENTER THE COEFFICIENT OF THE X TERM ";INPUTB;
   PRINT@448,"ENTER CONSTANT ";INPUTC
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PROGRAMS

```

120 B=B/A;C=C/A;IFC=0THENR1=0;R2=-B;GOTO124ELSEB=B*4;C;
IFD=0THENR1=-B/2;R2=R1;BOTO124ELSEX=8QR(ABS(D));
IFD>0THENR1=(X-B)/2;R2=-X/2;GOTO124ELSER=-B/2;J=X/2;
CLS:PRINT"ROOTS ARE COMPLEX":PRINT
122 PRINT"X1 = "R" + "J" I":PRINT:PRINT"X2 = "R" - "J" I":BOTO126
124 CLS:PRINT"ROOTS ARE REAL":PRINT:
PRINT"X1 = "R1:PRINT:PRINT"X2 = "R2
126 GOSUB222;IFX=1,4ELSE116
128 CLS:CLEAR100:PRINT"SIMULTANEOUS LINEAR EQUATIONS":
PRINTSTRING$(29,45);PRINT"
YOU'LL BE ASKED FOR CERTAIN DATA ABOUT THE EQUATIONS.":PRINT"
IF THE SYSTEM OF EQUATIONS WAS :-"PRINT
130 PRINT" 2 X1 + 3 X2 - 4 X3 = 11":
PRINT" 5 X1 - 23 X2 + 12 X3 = 4":
PRINT" 7 X1 + .28 X2 + 13 X3 = 120":PRINT"
THEN YOU WOULD ENTER 3 IN REPLY TO 'HOW MANY EQUATIONS ?':
PRINT"2 IN REPLY TO 'A(1,1) ?', 3 IN REPLY TO 'A(1,2) ?',"
132 PRINT"
-4 IN REPLY TO 'A(1,3) ?', AND 11 IN REPLY TO 'B(1) ?', AND SO ON FOR THE OTHE
R TWO EQUATIONS.":PRINT:
PRINT" PRESS ANY KEY TO CONTINUE":A$=INKEY$
134 A$=INKEY$:IFA$=" ",134ELSECLS:DEFINTI,J,K,L,N
136 PRINT@64,CHR$(30):PRINT@64,"HOW MANY EQUATIONS ";INPUTN:
IFN<1 PRINT@192,"NOT A VALID ENTRY, TRY AGAIN":BOTO136ELSE
IFN>16 PRINT@192,"MUSTN'T BE GREATER THAN 16 ";GOTO136
ELSEPRINT@192,CHR$(30):DIMA(N,N),B(N),C(N)
138 FORJ=1TON:FORK=1TON:PRINT"A ("J","K") = ";INPUTA(J,K):
NEXTK:PRINT" B ("J") = ";INPUTB(J):PRINT:NEXTJ
140 IFN=LANDA(1,1)=0,154ELSEIFN=1THENC(1)=B(1)/A(1,1):
BOTO150ELSEFORK=1TON-1:I=K+1:L=K
142 IFABS(A(I,K))>ABS(A(L,K))THENL=I:IFI<NTHENI=I+1;GOTO142ELSE
IFL=KTHENI=K+1;GOTO146
144 FORQ=KTON:D=A(K,J):A(K,J)=A(L,J):A(L,J)=D:NEXT:
D=B(K):B(K)=B(L):B(L)=D:I=K+1
146 IFA(K,K)=0THEN154ELSEA(I,K)/A(K,K):A(I,K)=0:
FORJ=K+1TON:A(I,J)=A(I,J)-D*A(K,J):NEXT:
B(I)=B(I)-D*B(K):IFI<NTHENI=I+1;GOTO146ELSENEXT
148 IFA(N,N)=0THEN154ELSEC(N)=B(N)/A(N,N):
FORI=N-1TOSTEP-1:D=0:FORJ=I+1TON:D=D+A(I,J)*C(J):IFA(I,I)=0
THEN154ELSEC(I)=(B(I)-D)/A(I,I):NEXTJ,I
150 CLS:PRINT"THE SOLUTION SET IS :-"PRINT:
FORI=1TON:PRINT" X "I" = "C(I):NEXT
152 GOSUB222;IFX=1,4ELSECLS:CLEAR:GOTO136
154 CLS:PRINT@400,"NO SOLUTION IS POSSIBLE":GOTO152
156 CLS:CLEAR100:PRINT"
LEAST SQUARES CURVE FITTING, INTERPOLATION AND EXTRAPOLATION":
PRINTSTRING$(61,45);PRINT"
YOU CAN FIT AN EQUATION OF DEGREE 1, 2, 3, 4, 5, OR 6 TO ANY NUMBER OF PAIR
S OF DATA POINTS UP TO A MAXIMUM OF 50 PAIRS.":
158 PRINT"
IF YOU CHOOSE A DEGREE 1 EQUATION THEN THE PROGRAM WILL GIVE THE BEST STRAIGH
T LINE FIT THROUGH THE DATA POINTS, AND THIS IS 'LINEAR REGRESSION'. HIGHER ORD
ER EQUATIONS GENERALLY FIND A
BETTER FIT IF A STRAIGHT LINE SOLUTION ISN'T APPROPRIATE"
160 PRINT"
ENTER THE DATA POINTS IN PAIRS. FIRST ENTER THE X CO-ORDINATE, THEN A COMMA, A
ND THEN THE Y CO-ORDINATE.":PRINT@910,"PRESS ANY KEY TO CONTINUE":A$=INKEY$
162 A$=INKEY$:IFA$=" ",162ELSECLS
164 PRINT@64,CHR$(30):PRINT@64,
"HOW MANY PAIRS OF DATA POINTS ARE YOU ENTERING ";
INPUTNP:IFNP<2ORNP>50DRNP<>INT(NP)THENPRINT@192,"INVALID ENTRY":GOTO164ELSEPR
INT@192,
"TYPE A COMMA BETWEEN THE X AND Y VALUES BEFORE PRESSING THE 'ENTER' KEY"
166 DIMX(NP),Y(NP),A(7,7),B(7),C(7),P(12):DEFINTI,J,K,L
168 FORJ=1TONP:INPUT" X , Y = ";X(J),Y(J):NEXTJ:CLS
170 PRINT@64,CHR$(30):PRINT@64,
"DEGREE OF POLYNOMIAL TO BE FITTED ";INPUTD:
IFD<1ORD>INT(D)THENPRINT@192,"INVALID ENTRY, TRY AGAIN":
GOTO170ELSEPRINT@192,CHR$(30):IFD>6THENPRINT@192,
"MUSTN'T BE MORE THAN 6":GOTO170ELSEPRINT@192,CHR$(30)
172 IFD=NPTHENPRINT"
NOT ENOUGH DATA PAIRS FOR THAT DEGREE OF EQUATION. ENTER AGAIN." :GOTO170ELSEPR
INT@256,CHR$(30):D2=2*D:N=D+1:FORJ=1TOD2:P(J)=0: FORK=1TONP:P(J)=P(J)+X(K)*Y(N
E XTK,J):P(0)=NP:B(1)=0:FORJ=1TONP: B(1)=B(1)+Y(J):NEXTJ:IFN=1,176
174 FORJ=2TON: B(J)=0:FORK=1TONP: B(J)=B(J)+Y(K)*X(K)*C(J-1):
NEXTK,J
176 FORJ=1TON:FORK=1TON: A(J,K)=P(J+K-2):NEXTK,J:GOSUB194
178 CLS:PRINT" POWER OF X COEFFICIENT
-----":FORJ=1TON:
PRINT" J-1,C(J):NEXT
180 Q=0:FORJ=1TONP:Q=Q+Y(J):NEXT:M=Q/NP:T=0;G=0:FORJ=1TONP:Q=0:
FORK=1TON:Q=Q+C(K)*X(J)*C(K-1):NEXTK:T=T+(Y(J)-Q)/2:
G=G+(Y(J)-M)/2:NEXTJ:IFB=0THENT=100:
GOTO182ELSESET=100*SQR(1-T/G)
182 PRINT"
PERCENT GOODNESS OF FIT OF POLYNOMIAL TO THE DATA = "T%":
PRINT:PRINT"0 % = USELESS, 90 % = FAIR, 100 % = PERFECT": PRINT@974,"PRE
SS ANY KEY TO CONTINUE":A$=INKEY$
184 A$=INKEY$:IFA$=" ",184
186 CLS:PRINT"
DO YOU WANT TO :-"PRINT"
< A > INTERPOLATE OR EXTRAPOLATE ON THE DATA
< B > TRY TO FIT ANOTHER DEGREE EQUATION TO THE SAME DATA
< C > NEITHER OF THESE":A$=INKEY$
188 A$=INKEY$:IFA$="A",190ELSEIFA$="B"THENCLS:GOTO170ELSE
IFA$="C",4ELSE188
190 CLS:PRINT"
ENTER THE VALUE OF X FROM WHICH YOU WANT TO DETERMINE THE
VALUE OF Y ":INPUTZ:PRINT:YZ=0:FORK=1TON:YZ=YZ+C(K)*Z*(K-1):
NEXTK:PRINT" FOR X = "Z" Y = "YZ:PRINT:PRINT"
ANY MORE DATA < 'Y' OR 'N' > ?":A$=INKEY$
192 A$=INKEY$:IFA$="Y",190ELSEIFA$="N",186ELSE192
194 IFN=1THENC(1)=B(1)/A(1,1):RETURNELSEFORK=1TON-1:I=K+1:L=K
196 IFABS(A(I,K))>ABS(A(L,K))THENL=I:ELSEIFL<NTHENI=I+1;GOTO196
ELSEIFL=KTHEN I=K+1;GOTO196ELSEFORQ=KTON:Q=A(K,J):
A(K,J)=A(L,J):A(L,J)=Q:NEXTJ:Q=B(K):B(K)=B(L):B(L)=Q:I=K+1
198 D=A(I,K)/A(K,K):A(I,K)=0:FORJ=K+1TON:A(I,J)=A(I,J)-D*A(K,J):
NEXTJ:B(I)=B
(I)-D*B(K):IFI<NTHENI=I+1;GOTO198ELSENEXT
200 C(N)=B(N)/A(N,N):FORI=N-1TOSTEP-1:Q=0:FORJ=I+1TON:

```

PROGRAMS

```

Q=Q+A(I,J)*C(J);C(I)=(B(I)-Q)/A(I,I);NEXTJ,I;RETURN
202 CLS: CLEAR100:PRINT"STATISTICS":PRINTSTRING$(10,45):PRINT
204 PRINT@192,CHR$(30):PRINT@192,
"HOW MANY ITEMS OF DATA ARE YOU GOING TO INPUT ";INPUTN:
IFN<20RN<>INT(N)THENPRINT@320," NOT VALID, TRY AGAIN":
GOTO204ELSEPRINT@320,CHR$(30)
206 DIMA(N):SU=0:M=1:NM=N-1:FORJ=1TON:PRINT" DATUM "J" = ";
INPUTA(J):M=M+A(J):SU=SU+A(J):NEXTJ:AV=SU/N:
MN=(ABS(M)[(1/N)]*(SGN(M)))
206 DIMA(N):SU=0:M=1:NM=N-1:FORJ=1TON:PRINT" DATUM "J" = ";
INPUTA(J):M=M+A(J):SU=SU+A(J):NEXTJ:AV=SU/N:
MN=(ABS(M)[(1/N)]*(SGN(M)))
208 GOSUB218:RA=A(1)-A(N):MA=A(1)+A(N):MI=A(N):MR=(A(1)+A(N))/2:Q=0:
FORI=1TON:D=A(I)-AV:Q=Q+D[2]:NEXTI:VA=Q/(N-1):ST=SGR(VA)
210 CLS:PRINT"THE STATISTICS ARE AS FOLLOWS I-":
PRINTSTRING$(33,45):PRINT"
ARITHMETIC MEAN = "AV:PRINT" GEOMETRIC MEAN = "MN:
PRINT" MEDIAN = "ME:PRINT" SUM OF VALUES = "SU:
PRINT" MAXIMUM = "MA:PRINT" MINIMUM = "MI
212 PRINT" RANGE = "RA:PRINT" MID-RANGE = "MR:
PRINT" VARIANCE = "VA:PRINT" STANDARD DEVIATION = "ST:
PRINT@96,
" PRESS 'S' TO REVIEW THE DATA IN SORTED ORDER OR 'D' TO INPUT
ANOTHER DATA S
ET";
214 AS=INKEY$:IFA$="S",216ELSEIFA$="D",202ELSE214
216 CLS:PRINT"SORTED DATA FROM LEFT TO RIGHT":PRINT:
FORI=1TON:STEP-1:PRINTA(I),NEXT:GOSUB222:IFX=1,4ELSE202
218 FORI=1TON:M=I+1:M=1:FORJ=1TON:IFA(M)>A(J)THEN220ELSEM=J
220 NEXTJ:T=A(I):A(I)=A(M):A(M)=T:NEXTI:D=N/2:ID=INT(D):
IFD=IDTHENMED=(A(ID)+A(ID+1))/2:RETURNELSE
IFD<IDTHENMED=A(ID):RETURNELSEMED=A(ID+1):RETURN
222 X=2:PRINT@960,CHR$(30):PRINT@960,
" ANY MORE DATA <'Y' OR 'N'>";GOSUB224:IFA$="N"THENX=N:1: RETURNLSERET
URN
224 AS=INKEY$:IFA$="Y",224ELSEIFA$="Y"ORAS="N" RETURNLSE224
226 CLS:PRINT"SPEARMAN'S COEFFICIENT OF RANK CORRELATION":
PRINTSTRING$(42,45):PRINT"
THIS GIVES A MEASURE OF HOW WELL TWO SETS OF DATA FIT TOGETHER"
228 PRINT"
FOR EXAMPLE, IF ONE SET WAS THE HEIGHTS OF CHILDREN AND THE
OTHER SET WAS THEIR AGES, THEN YOU WOULD EXPECT A CLOSE
RELATIONSHIP TO EXIST BETWEEN THE TWO SETS OF DATA.";
230 PRINT"
ON THE OTHER HAND, IF ONE SET WAS INCHES OF RAINFALL FOR
CERTAIN MONTHS, AND THE OTHER CONTAINED THE NUMBER OF PEOPLE WHOBOUGHT COMPUTERS
DURING THOSE MONTHS, THEN YOU WOULDN'T EXPECT
ANY CLOSE RELATIONSHIP BETWEEN THE TWO SETS OF DATA.";
232 PRINT"
BEWARE OF SPURIOUS CORRELATION. FOR EXAMPLE, THE NUMBER OF
RADIO LICENCES TAKEN OUT DURING THE YEARS 1920 AND 1940, AND THENUMBER OF PEOPLE
ENTERING LUNATIC ASYLUMS DURING THOSE YEARS,
SHOWS A VERY CLOSE CORRELATION."
234 PRINT" PRESS ANY KEY TO CONTINUE";AS=INKEY$
236 AS=INKEY$:IFA$="Y",236
238 CLS: CLEAR100:PRINT"
DO YOU WANT THE HIGHEST VALUE IN EACH SET TO BE RANKED FIRST, AS IN MARKS IN A
N EXAM WHERE THE PERSON WHO GOT 98 OUT OF 100 WOULD COME FIRST, AND THE PERSON
WHO GOT 82 WOULD BE RANKED
SECOND, ET. CETERA.,"
240 PRINT"
OR DO YOU WANT THE LOWEST VALUE IN EACH SET RANKED FIRST, AS
IN THE CASE, SAY, WHERE THE PERSON GETTING THE FEWEST NUMBER OF
PENALTY POINTS WOULD BE RANKED FIRST.":PRINT:
PRINT" TYPE 'H' OR 'L':AS=INKEY$
242 AS=INKEY$:IFA$="H",242ELSEIFA$<>"H"ANDAS<>"L",238ELSECLS:
PRINT"MEANINGFUL RESULTS ARE NOT POSSIBLE WITH LESS
THAN 5 ITEMS IN EACH DATA SET."
244 PRINT@192,CHR$(30):
PRINT@192,"HOW MANY ITEMS OF DATA IN EACH SET ";INPUTN:
IFN<50RN<>50RN<>INT(N)THENPRINT@320,"BETWEEN 5 AND 50.":
GOTO244ELSEPRINT@320,CHR$(30):DIMA(N),B(N),C(N),D(N),E(N)
246 IFF=0THENPRINT:PRINT"ENTER FIRST SET OF VALUES"ELSEPRINT:
PRINT"ENTER CORRESPONDING SECOND SET OF VALUES"
248 PRINT:FORJ=1TON:PRINT" DATUM"J" = ";INPUTA(J):NEXT:
FORJ=1TON:FORK=1TON:IFA(J)>A(K)THENM=S+1:NEXTKSENEXTK
250 IFA$="H"THENM=J-N+1:IFM=1:GOTO252ELSEM=J-N+1:GOTO252
252 IFF=1,254ELSEFORJ=1TON:IFA(J)=E(J):D(J)=A(J):NEXT:IFF=1:GOTO246
254 FORJ=1TON:B(J)=(C(J)-E(J))/(2*(X+Z+B(J)):Z=Z+B(J):NEXT:
CC=1-(6**X)/(N*(N-1)):CLS:PRINT"CORRELATION COEFFICIENT IS":
PRINTTAB(30)CC
256 PRINT:PRINT"
-0.1 OR +0.1 = NO CORRELATION
-0.5 OR +0.5 = LITTLE CORRELATION
-0.7 OR +0.7 = FAIRLY GOOD CORRELATION
-0.8 OR +0.8 = GOOD CORRELATION";
258 PRINT"
-0.85 OR +0.85 = VERY GOOD CORRELATION
-0.9 OR +0.9 = SIGNIFICANT CORRELATION
-0.95 OR +0.95 = HIGHLY SIGNIFICANT CORRELATION
-1 OR +1 = PERFECT CORRELATION":
GOSUB222:IFX=1,4ELSE238

```



Apple Text Maker

by Colin Davies

'Text Maker' is a disk utility routine for a 48k Apple 11+ running Apple DOS.

The routine is used to turn programs and subroutines stored on disk into text files.

Although text files occupy approximately a third more disk space than Basic program files, they have two advantages. The first is that text files can be EXECuted; this

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PROGRAMS

enables programs and routines to be merged. The second advantage is that you can edit programs stored in this form on a word processor. I've written programs in WordStar on several occasions, and the superior editing facilities make programming a lot easier.

When you've typed in the routine, run it. Enter the destination slot and drive when prompted, and 'Text Maker' will helpfully store itself as a locked text file called 'STORE'. To use the routine, simply EXECute STORE. This will append 'Text Maker' to the program currently stored in memory. 'Text Maker' will then run itself, ask you for a filename, destination drive and slot and store the

program in memory (minus itself) as a text file under the filename given. Finally, it switches back to the original logged drive and deletes itself from RAM. All very neat.

The routine assumes you have 48k RAM and that there is a 'HELLO' file present on the work disk; if you store your HELLO programs under a different filename, you'll have to amend line 63998 accordingly.

'Text Maker' occupies the fourteen highest available line numbers: that is, 63986-63999. These line numbers, therefore, must be avoided in your own programs.

```
63986 N$ = "STORE":N = 1: GOTO 63988
63987 HOME : INPUT "ENTER FILENAME ";N$
63988 PRINT : INPUT "DESTINATION SLOT ";DS
63989 PRINT : INPUT " DRIVE ";DD
63990 SS = PEEK ( - 18953) / 16
63991 SD = PEEK ( - 18952):D$ = CHR$ (4)
63992 PRINT D$"OPEN "N$",S"DS",D"DD: PRINT D$"UNLOCK "N$: PRINT D$"DELETE
"N$
63993 PRINT D$"OPEN "N$: PRINT D$"WRITE "N$
63994 POKE 33,30: IF NOT N THEN 63996
63995 LIST 63987,: PRINT "RUN 63987": GOTO 63997
63996 LIST 0,63986: PRINT "HOME"
63997 PRINT D$"CLOSE "N$: IF N THEN PRINT D$"LOCK "N$
63998 PRINT D$"VERIFY HELLO,S"SS",D"SD
63999 TEXT : HOME : DEL 63986,63999
```

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PROGRAMS



Vic 20 Spider

Here's a short arcade game for the VIC-20. Instructions are in the program and a rough description of how the program works is included on the right of the listing.

Note that lines 20, 730, 810, 815, 875, 915 and 1010 contain statements using

square brackets: [and]. These statements mean that when the program is typed into the machine the characters inside the brackets (including the brackets) must be replaced by the special characters that the VIC 20 uses to perform that function.

For instance, in line 730 [HOME][6CR][8CD] should be changed to one cursor home character, six cursor right characters and eight cursor downs. The ' ' in line 100 should be replaced by the up arrow (next to the RESTORE key) meaning 'raise to the power'.

```

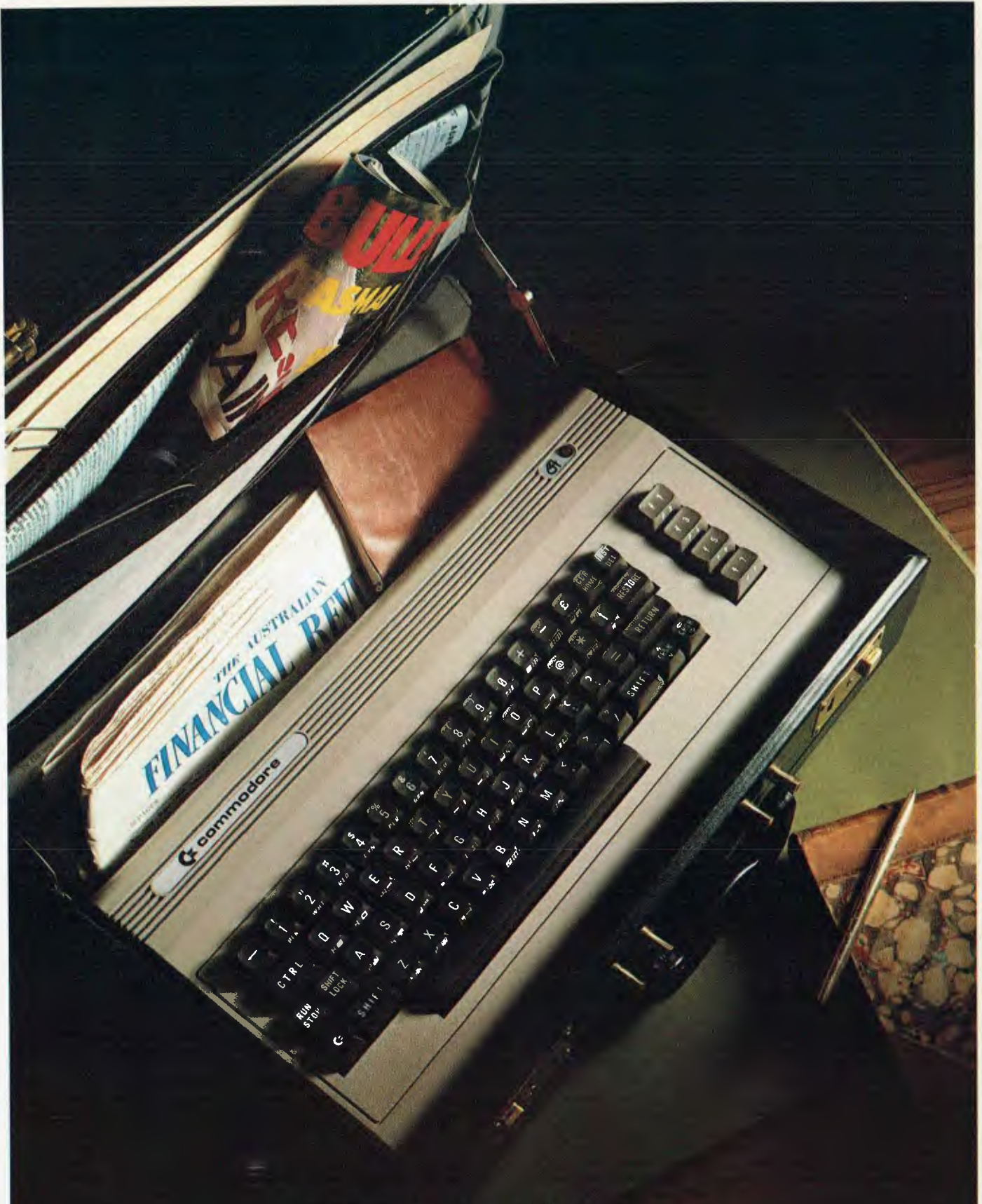
LIST
1 REM ** SPIDER **
2 REM
3 REM FOR UNEXPANDED
4 REM VIC 20
5 REM
10 GOTO 1010
15 REM ** UPDATE SCORE **
20 PRINT "[HOME]HS "; TAB(8-LEN(STR*(HS))); HS: " SC "; TAB(22-LEN(STR*(SC)
));
25 RETURN
30 REM ** MOVE MAN **
40 GET K#
50 IF K# = "I" THEN D = 1
52 IF K# = "J" THEN D = 7
54 IF K# = "K" THEN D = 3
56 IF K# = "M" THEN D = 5
60 X = X+XD(D); Y = Y+YD(D); IF X<0 OR X>LL-1 OR Y<1 OR Y>LD OR PEEK(TL+Y*LL+
X) = PL THEN 710
70 POKE TL+Y*LL+X,PL: POKE AT+Y*LL+X,RED
80 IF X<>SX OR Y<>SY THEN 90
82 FOR I = 1 TO 5: SC = SC+1: GOSUB 20: FOR J = 230 TO 250
84 POKE VL,15: POKE S1,J: NEXT J: NEXT I: POKE V,0: POKE S1,0
86 SX = FNR(LL): SY = FNR(LD): IF PEEK(AT+SY*LL+SX) = RED THEN 86
87 POKE TL+SY*LL+SX,SP: POKE AT+SY*LL+SX,GREEN
90 REM ** MOVE SPIDER **
100 DS = SQR((X-SX)**2+(Y-SY)**2)/15: M = ABS(RND(1)*DS)+ABS(RND(1)*DS)
110 NX = SX+M*SGN(SX-X): NY = SY+M*SGN(SY-Y)
113 IF M = 0 THEN 40
115 IF NX>1 AND NX<LL-1 AND NY>2 AND NY<LD-1 AND PEEK(AT+NY*LL+NX) <> RED THEN
130
120 NX = SX-XD(FNR(8)): NY = SY-YD(FNR(8)): M = M-1: GOTO 113
130 POKE AT+SY*LL+SX,1: SX = NX: SY = NY: POKE TL+SY*LL+SX,SP: POKE AT+SY*LL+S
X,GREEN
140 GOTO 40

700 REM ** END GAME **
710 POKE VL,15: POKE S1,230: FOR I = 1 TO 200: NEXT I: POKE S1,240: FOR I = 1
TO 400: NEXT I
720 POKE S1,245: FOR I = 1 TO 500: NEXT I: POKE S1,0
730 PRINT "[HOME][6CR][8CD]SCORE "; SC
740 IF SC>HS THEN FOR I = 128 TO 255 STEP 3: POKE VL,15: POKE S1,I: FOR J = 1
TO 1 STEP .10: NEXT J: NEXT I
750 IF SC>HS THEN HS = SC: PRINT "[CD][4CR]NEW HIGH SCORE"
760 POKE S1,0: FOR I = 1 TO 1000: NEXT I

800 REM ** TITLE PAGE **
810 PRINT "[CLS]": GOSUB 20
815 PRINT: PRINT " [SHIFT-Q] SPIDER [SHIFT-Q]"
820 PRINT: PRINT "SWOT AS MANY BLOBS AS YOU CAN BEFORE YOU HIT YOUR OWN LINE O
80"
830 PRINT "OFF THE SCREEN": PRINT: PRINT "USE J LEFT K RIGHT I UP M D
OWN"
840 PRINT: PRINT "GOOD LUCK ..."
850 PRINT: PRINT "PRESS P PLAY OR S STOP"
870 I = AT
875 GET A#: IF A# = "S" THEN PRINT "[CLS]": END
877 IF A# = "P" THEN 910
890 POKE I,FNR(6)+1
895 I = I+1: IF I < 38750 THEN 875
897 GOTO 870
900 REM ** NEW GAME **
910 SC = 0
915 PRINT "[CLS]": GOSUB 20
920 X = 10: Y = 10: D = 1: SX = FNR(LL): SY = FNR(LD)
940 POKE TL+LL*Y+X,PL: POKE AT+LL*Y+X,RED: POKE TL+LL*SY+X,SP: POKE AT+LL*SY+
SX,GREEN
990 GOTO 40
1000 REM ** INIT **
1010 PRINT"[CLS]": POKE 36879,27
1020 TL = 7680: AT = 38400: LL = 22: LD = 22
1030 VL = 36878: S1 = 36874: NS = 36877
1040 PL = 102: SP = 81: RED = 2: GREEN = 5
1080 DEFFNR(X) = INT(RND(1)*X+1)
1100 FOR I = 1 TO 8: READ XD(I),YD(I): NEXT I
1110 DATA 0,-1,1,-1,1,0,1,1,0,1,-1,1,-1,0,-1,-1
1120 GOTO 810

```

- 10 go to the INIT section
- 20 subroutine to update score line
- 40 move player's line
- 60 go to 710 if player leaves screen or hits line
- 80 hit spider so make noise, update score and replace spider
- 100 move spider if necessary. Uses Pythagora's theorem to calculate the distance between the player and spider. Normally the spider moves away from the player (using SGN function) but if it can't it will move randomly
- 140 loops to 40 to continue the main game loop
- 700 End of game
- 710 fanfare at end of game
- 740 update high score
- 760 pause before dropping into title page
- 800 Present title page/instructions
- 870-897 loops while waiting for a keypress. Each loop alters the next colour attribute of the screen, making the instructions change colour
- 900 New game
- 915 sets initial positions of the player and spider and starts a game
- 1000 Init section
- 1010 sets POKE and PEEK addresses and values for playing pieces, colours and so on



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COMPUTER

PROGRAMS

Program
of the Month

Commodore 64 Sprite Clock

by Andy Holmes

This program produces a novel 24-hour clock using eight coloured sprites running in 6k. A brief description is presented on the right hand side of the listing.

	<pre> 5 PRINT"Q" 10 REM ***** 20 REM ** 30 REM * A 24 - HOUR CLOCK * 40 REM * USING COLOURED SPRITES * 50 REM * 60 REM ** 70 REM ** 80 REM ***** 90 REM 100 REM JUST ENTER THE TIME OF DAY IN 110 REM 24 HOUR MODE. IF YOU HAVE 120 REM TYPED IN AN OUT OF RANGE NUMBER 130 REM THEN THE PROGRAM WILL RESPOND 140 REM BY MAKING YOU RETYPE THE ENTRY. 150 REM 160 REM ONCE YOU HAVE TYPED IN THE 170 REM PROGRAM YOU MAY WANT TO TAKE 180 REM OUT THE <REM> STATEMENTS. 190 REM THESE ARE ONLY HERE TO EXPLAIN 200 REM WHAT THE PROGRAM IS DOING, AND 210 REM IF THEY ARE REMOVED WILL NOT 220 REM AFFECT ANY JUMPS IN THE PROGRAM 230 REM 300 REM**♦♦ VARIABLES ♦♦ 310 SP=53248:PO=2040:CH=192 320 REM**♦♦ RESERVE MEMORY ♦♦ 330 POKES2,48:POKE56,48 340 REM**♦♦ SPRITE DATA INPUT ♦♦ 350 FORI=12288TO12990:READA 360 POKEI,A:NEXT 370 REM**♦♦ SET SCREEN COLOUR ♦♦ 380 POKESP+32,0:POKESP+33,0 390 REM**♦♦ COLOUR SPRITES 0 & 1 BLUE ♦♦ 400 POKESP+39,14:POKESP+40,14 410 REM**♦♦ COLOUR SPRITES 3 & 4 RED ♦♦ 415 POKESP+42,2:POKESP+43,2 420 REM**♦♦ COLOUR SPRITES 2 & 5 YEL'W♦♦ 430 POKESP+41,7:POKESP+44,7 432 REM**♦♦ COLOUR SPRITES 6 & 7 GREEN♦♦ 435 POKESP+45,5:POKESP+46,5 440 REM**♦♦ TURN OFF ALL SPRITES ♦♦ 450 POKESP+21,0 460 REM**♦♦ DOUBLE SPRITE SIZE ♦♦ 470 POKESP+23,255:POKESP+29,255 480 REM**♦♦ SET SPRITE Y COORDINATES ♦♦ 490 FORI=1TO15STEP2 500 POKESP+I,125:NEXT 510 REM**♦♦ SET MSB FOR SPRITES 6 * 7 ♦♦ 520 POKESP+16,192 530 REM**♦♦ SET SPRITE X COORDINATES ♦♦ 540 POKESP,17:POKESP+2,60:POKESP+4,97 550 POKESP+6,136:POKESP+8,179 560 POKESP+10,218:POKESP+12,3 570 POKESP+14,46 580 REM**♦♦ SET ALL SPRITE POINTERS ♦♦ 590 FORI=0TO7 600 POKEPO+I,192:NEXT 610 REM**♦♦ SET SPRITE POINTERS 2 * 4 ♦♦ 620 POKEPO+3,202:POKEPO+5,202 630 REM**♦♦ REAL TIME INPUT ♦♦ 640 PRINT"Q" 650 PRINT" [X] REAL-TIME , 24 HOUR SPRITE CLOCK [] " 660 PRINT" [I] [] " 670 PRINT" " 680 PRINT"***** PLEASE ENTER THE CORRECT TIME " 690 INPUT"***** HERE >>> *****:TM\$ 700 IFLEN(TM\$)>6THEN690 710 IFLEN(TM\$)<6THEN690 720 IFVAL(LEFT\$(TM\$,2))>24THEN690 730 IFVAL(MID\$(TM\$,3,2))>59THEN690 740 IFVAL(RIGHT\$(TM\$,2))>59THEN690 750 TI\$=TM\$ 760 PRINT"***** 770 PRINT"***** </pre>
300-400	Initialise program variables, load character data, set sprite colours
410-435	Final part of sprite colour set up
440-620	Initialise all sprite data
630-770	Time input routine. Time <i>must</i> be entered as full six digits (HHMMSS) in 24-hour form

PROGRAMS

```

780 REM"♦♦   CLOCK UPDATE ROUTINE   ♦♦
785 POKESP+21,255
790 FORI=1TO6:T=VAL(MID$(TI$,I,1))
800 IFI=1THENPOKEPO+0,CH+T:REM SPRITE 0
810 IFI=2THENPOKEPO+1,CH+T:REM SPRITE 1
820 IFI=3THENPOKEPO+3,CH+T:REM SPRITE 3
830 IFI=4THENPOKEPO+4,CH+T:REM SPRITE 4
840 IFI=5THENPOKEPO+6,CH+T:REM SPRITE 6
850 IFI=6THENPOKEPO+7,CH+T:REM SPRITE 7
860 NEXT:GOTO790
    
```

```

1000 REM"♦♦   DATA FOR CHARACTER 0   ♦♦
1010 DATA7,255,224,14,15,240,12,7
1020 DATA240,8,3,240,8,3,240,8
1030 DATA3,240,8,3,240,8,3,240
1040 DATA8,3,240,8,3,240,8,3
1050 DATA240,8,3,240,8,3,240,8
1060 DATA3,240,8,3,240,8,3,240
1070 DATA8,3,240,8,3,240,12,7
1080 DATA240,14,15,240,7,255,224,0
1090 REM
    
```

```

1100 REM"♦♦   DATA FOR CHARACTER 1   ♦♦
1110 DATA0,254,0,0,127,0,0,63
1120 DATA0,0,63,0,0,63,0,0
1130 DATA63,0,0,63,0,0,63,0
1140 DATA0,63,0,0,63,0,0,63
1150 DATA0,0,63,0,0,63,0,0
1160 DATA63,0,0,63,0,0,63,0
1170 DATA0,63,0,0,63,0,0,63
1180 DATA0,0,63,0,0,30,0,0
1190 REM
    
```

```

1200 REM"♦♦   DATA FOR CHARACTER 2   ♦♦
1210 DATA7,255,224,14,15,240,12,7
1220 DATA240,8,3,240,8,3,240,0
1230 DATA3,240,0,3,240,0,3,240
1240 DATA0,3,240,0,3,240,0,7
1250 DATA240,0,15,240,7,255,224,14
1260 DATA0,0,12,0,0,0,0,0
1270 DATA8,1,224,8,3,240,12,7
1280 DATA240,14,15,240,7,255,224,0
1290 REM
    
```

```

1300 REM"♦♦   DATA FOR CHARACTER 3   ♦♦
1310 DATA7,255,224,14,15,240,12,7
1320 DATA240,8,3,240,0,3,240,0
1330 DATA3,240,0,7,240,0,15,240
1340 DATA1,255,240,0,15,240,0,7
1350 DATA240,0,3,240,0,3,240,0
1360 DATA3,240,0,3,240,8,3,240
1370 DATA8,3,240,8,3,240,12,7
1380 DATA240,15,15,240,7,255,224,0
1390 REM
    
```

```

1400 REM"♦♦   DATA FOR CHARACTER 4   ♦♦
1410 DATA7,255,224,14,15,240,12,7
1420 DATA240,8,3,240,8,3,240,8
1430 DATA3,240,8,3,240,8,3,240
1440 DATA8,3,240,8,3,240,8,3
1450 DATA240,8,3,240,12,7,240,14
1460 DATA15,240,7,255,252,0,15,240
1470 DATA0,7,240,0,3,240,0,3
1480 DATA240,0,3,240,0,1,224,0
1490 REM
    
```

```

1500 REM"♦♦   DATA FOR CHARACTER 5   ♦♦
1510 DATA7,255,224,14,7,240,12,3
1520 DATA240,8,3,240,8,1,224,8
1530 DATA0,0,12,0,0,14,0,0
1540 DATA7,255,224,0,15,240,0,7
1550 DATA240,0,3,240,0,3,240,0
1560 DATA3,240,0,3,240,0,3,240
1570 DATA8,3,240,8,3,240,12,7
1580 DATA240,14,15,240,7,255,224,0
1590 REM
    
```

```

1600 REM"♦♦   DATA FOR CHARACTER 6   ♦♦
1610 DATA7,255,224,14,7,240,12,3
1620 DATA240,8,3,240,8,1,224,8
1630 DATA0,0,12,0,0,14,0,0
1640 DATA15,255,224,14,15,240,12,7
1650 DATA240,8,3,240,8,3,240,8
1660 DATA3,240,8,3,240,8,3,240
1670 DATA8,3,240,8,3,240,12,7
1680 DATA240,14,15,240,7,255,224,0
1690 REM
    
```

780-860 Routine to perform correct clock display

1000-2000 Data statements for digit display format. Characters 0, 1, 2

Data statements for digit display format. Characters 3, 4, 5 and 6

PROGRAMS



Data statements for digit display format.
Characters 7, 8, 9 and 10

```

1700 REM"♦♦ DATA FOR CHARACTER 7 ♦♦
1710 DATA7,255,224,14,15,240,12,7
1720 DATA240,8,3,240,8,3,240,8
1730 DATA3,240,0,3,240,0,3,240
1740 DATA0,3,240,0,7,240,0,15
1750 DATA224,0,31,192,0,63,128,0
1760 DATA127,0,0,254,0,1,252,0
1770 DATA3,248,0,7,240,0,15,224
1780 DATA0,31,192,0,31,128,0,0
1790 REM
1800 REM"♦♦ DATA FOR CHARACTER 8 ♦♦
1810 DATA7,255,224,15,240,112,15,224
1820 DATA48,15,192,16,15,192,16,15
1830 DATA192,16,15,192,16,15,224,16
1840 DATA15,240,48,6,60,96,12,15
1850 DATA240,8,7,240,8,3,240,8
1860 DATA3,240,8,3,240,8,3,240
1870 DATA8,3,240,8,3,240,12,7
1880 DATA240,14,15,240,7,255,224,0
1890 REM
1900 REM"♦♦ DATA FOR CHARACTER 9 ♦♦
1910 DATA7,255,224,14,15,240,12,7
1920 DATA240,8,3,240,8,3,240,8
1930 DATA3,240,8,3,240,8,3,240
1940 DATA8,3,240,8,3,240,12,7
1950 DATA240,14,15,240,7,255,240,0
1960 DATA15,240,0,7,240,0,3,240
1970 DATA8,3,240,8,3,240,12,7
1980 DATA240,14,15,240,7,255,224,0
1990 REM
2000 REM"♦♦ DATA FOR CHARACTER 10 ♦♦
2010 DATA0,0,0,0,0,0,0,62
2020 DATA0,0,127,0,0,127,0,0
2030 DATA127,0,0,127,0,0,62,0
2040 DATA0,0,0,0,0,0,0,62
2050 DATA0,0,127,0,0,127,0,0
2060 DATA127,0,0,127,0,0,62,0
2070 DATA0,0,0,0,0,0,0,0
2080 DATA0,0,0,0,0,0,0,0
    
```

Continued from page 104

on machines costing a great deal more.

Overall, Spectrum Basic has its idiosyncrasies, but it meshes fairly well with the hardware and has some useful features. For example the Microsoft construction `MID$(A$,N,M)` is replaced by `A$(N TO M)`, or in the special case where `M = 1`, `A$(N)`. A collection of appropriate keywords control the display functions described above, and BEEP sounds a tone of adjustable pitch for a specified period. The SAVE and LOAD commands don't just work on programs — you can use arrays in lieu of data files as well as storing blocks of memory, and there is a 'shorthand' way of saving the display buffer. MERGE is also included to make it easier to re-use routines without having to type them into each program.

Documentation for the Spectrum consists of two volumes. A 30 page booklet gets the beginner started with setting up instructions (which also appear on the back of the box) and a superficial look at the Spectrum and Basic. The programming manual is nearly 200 pages long and gives comprehensive coverage of the machine as seen by the Basic programmer, plus a good deal of information useful to the dabbler in machine code or the type who likes to stretch a computer to its limits. Examples are the address of the pointer to the character set (in case you want to develop your own) and the address of the byte that determines the duration of the keyclick. The index seemed to work well, at any rate it always led me straight to the subject of interest.

I also received five books about the Spectrum, all "Melbourne House" publications. There were two books on programming, a book of programs, a hardware manual with some construction projects, and a complete annotated disassembly of the Spectrum's ROM. There's plenty of food for thought in that lot.

Not only are there lots of programs and books for the Spectrum, but the UK micro magazines contain advertisements for all sorts of hardware accessories. For approximately \$100 there is a "games unit" with a speech synthesiser, a sound synthesiser, audio amplifier and speaker, and a joystick port for Atari-style controllers. The same manufacturer produces parallel and serial printer interfaces and a full sized keyboard. It's amazing what you can hang on to that expansion connector.

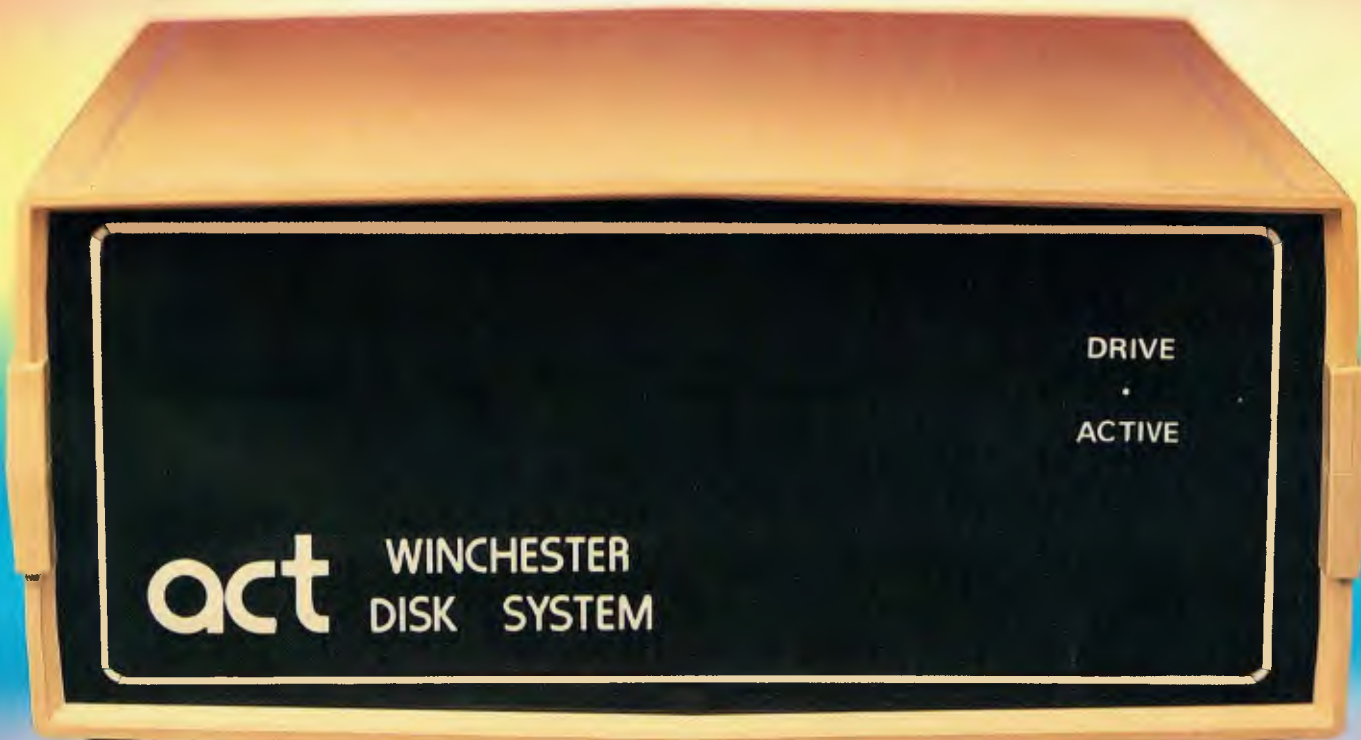
Sinclair don't have much to offer in the way of expansion. The printer originally sold with the ZX81 works with the Spectrum (even for graphics), and at the time of writing the long-heralded Microdrives had just been launched. The RS232/network interface has yet to appear, but it promises a way of sharing the already inexpensive Microdrives between several Spectrums.

It all boils down to this — if you simply want to run other people's programs, there are plenty to choose from; but if you prefer to roll your own, or dabble in hardware, then the Spectrum has already proved to be a hacker's delight. I found it very tempting.

Processor	Z80A
ROM	16k
RAM	48k (approx 40k user RAM, according to a non-Sinclair publication).

Ease of use	★ ★ ★
Ease of programming	★ ★ ★ ★
Expansion and accessories	★ ★ ★
Documentation	★ ★ ★ ★
Presentation	★ ★ ★

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